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ABSTRACT

This paper explores definitional problems of the equalization concept in school finance, highlights some problems in the measurement of this concept, and discusses its application to current State educational fiscal policy matters. To define equalization, the report poses basic questions covering the concept, surveys school finance literature for appropriate responses, and then progresses to a series of graphic models. To aid in measuring the concept, a technique is outlined for measuring equalization, and some illustrations of the use of this technique are provided.
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DEFINITION, MEASUREMENT, AND APPLICATION OF THE CONCEPT OF EQUALIZATION IN SCHOOL FINANCE

An Integration and Critique of School Finance Research Conducted on the Subject of Equal Educational Opportunity

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"The nations of our time cannot prevent the conditions of men from becoming equal; but it depends upon themselves whether the principle of equality is to lead them to servitude or freedom, to knowledge or barbarism, to prosperity or wretchedness?"

Alexis de Tocqueville

The belief that state governments should organize their fiscal institutions in such a fashion as to try to achieve equalization of educational opportunity has been a pervasive value in American school finance studies for many decades (James, 1961; 1972). Two major problems are encountered when the general concept of equalization is examined. In the first place a definition of equalization acceptable to a majority of educational researchers at any given point in time appears to have been as illusive as the Golden Fleece. The record also seems to indicate that this prize has been lost to each successive generation of researchers. Fiscal argonauts are therefore forever condemned to launching new quests to give meaning to the equalization concept. Secondly, among those who have somehow managed to attain a modest amount of agreement concerning a definition, there appears to be very little consensus on appropriate administrative strategies and tactics for achieving such a goal.

This paper therefore has a three-fold purpose. The initial task is to explore the definition of the concept of

equalization as it has been used in school finance studies. Definitional problems are investigated in the first two sections of this paper. This is done initially by the technique of posing what we believe are basic questions concerning the concept, and then surveying the school finance literature for appropriate responses. We then progress to the construction of a series of graphic models and continue the study of the facets of this concept using this heuristic and diagrammatic approach. The second task of this paper is to highlight some selected problems in the measurement of the concept of equalization. Therefore in the third portion of this paper and in appendix A we outline a technique for measuring equalization and provide some illustrations of the use of this technique. Since we are concerned with the practical as well as the more theoretical aspects of equalization, the fourth section of this paper and appendix B deal with the application of the concept to current state educational fiscal policy matters. The authors hope that state departments of education, state legislative committees, and special study commissions may find this final section of help as they struggle with demands for increasing equalization among school districts. Our efforts in this paper have been strongly influenced by the reasoning presented in a series of recent court decisions concerning educational finance (Hobson v. Hansen, 1967; McInnis v. Ogilvie, 1969; Serrano v. Priest, 1971; Van Dusartz v. Hatfield, 1971; Rodriquez v. San Antonio, 1971). The concluding statement

therefore comments on the role of the court in shaping state educational fiscal policy.

Basic Questions

We shall start our examination by asking, "equalization of what?" A brief survey of school finance literature will suggest that answers to this question have changed as American society itself has undergone major historical transformations. In the very early fiscal literature it appears that the equalization of interest was the equalization of local tax burden to support education (Cubberly, 1905). It has been suggested that this early concern over local tax burden arose out of the increasing attempts of many states at the end of the last century to mandate minimum levels of school services everywhere within state boundaries without regard to differences in local resources (Burke, 1957). Later, with the wide adoption of the Strayer-Haig allocation system, tax effort was more specifically defined in terms of equalization of the local property tax required to support a specified level of expenditures (Strayer and Haig, 1923). This notion that two taxpayers should not be required to shoulder unequal tax burdens for the same level of educational services is still very much of social and legal interest as can be seen from the fact that this was one of the two causes for action stated by plaintiff in a recent California school finance case (Serrano v. Priest, 1971).

The Great Depression left its mark on the study of school finance as it did on the study of all other aspects of American public finance. Earlier writers had previously expressed concern over disparities between school districts with regard to: (a) expenditure levels and (b) service levels. Writing in the shadow of the Great Depression it seemed essential to Henry Morrison (1930) to highlight this type of inequality. Morrison had earlier documented the extent of inequalities in Illinois public schools and had proceeded to castigate that state's system of finance as "appropriate to pioneer days." But society moved away from the depression and while expenditure and service inequalities among school districts continued to merit study, the strong reform overtones were no longer present (Mort and Cornell, 1938; Mort and Cornell, 1941). Occasionally a volume would appear which cast a spotlight upon expenditure level and service level inequalities among school districts (Johns and Morphet, 1952). In the main, however, egalitarian goals in school finance were not of high priority in the 1950's as can be seen from this quotation from a widely adopted school finance textbook of that period:

> Indeed, equality of educational opportunity is not attainable in a single school system. It is not even desirable in a decentralized school system. What is desirable is a rising standard of educational services, not equality of services. This means that it may be more important to see that the able and willing can move ahead than to concentrate upon correcting the worst conditions. (Burke, 1957, p. 561)

It should be pointed out that the author of this statement has changed his point of view concerning a fiscal policy appropriate for the current period (Burke, 1969).

The 1960's presented a vivid contrast with the 1950's. James (1961) launched the first of what was to become a series of very important studies at Stanford. In his initial study at Stanford he reaffirmed inequalities of expenditure, tax effort, and fiscal capacity as an important focus for research. The sociologist Sexton (1961) published an important contribution to the study of service inequalities within urban school districts while McLure (1964) and Lane (1964) were exploring interdistrict inequalities. At mid-decade Benson (1965) published an important, popular, and widely distributed little book that also did much to restore the study of fiscal inequalities to stage center.

The real turning point, however, came shortly after mid-decade. At least three events were taking place which may well have changed forever the concept of equalization in the study of school finance. In the first place the social upheavals of the city ghetto and the militancy of minority groups had placed the entire matter of inequalities in the forefront of public inspection. Secondly, the impact of the Coleman report (1966) was beginning to extend far beyond academic sociological circles. Thirdly, a movement within the legal profession was afoot that, while it did not surface until later, would have profound implications for the equalization

concept in school finance. By 1968 is was clear to many that the question, "equalization of what?" was going to be answered by a strong rededication to that ancient American dream, equalization of educational opportunity.

In rapid succession for the next four years there appeared a series of empirical studies and policy papers all dealing with various aspects of the inequality question. These studies differed greatly in design and purpose, and in the aspect of educational inequality chosen for investigation. All of them concluded, however, that a prime obligation of state departments of education was the utilization of the fiscal apparatus of the state to achieve equalization of educational opportunity (Coleman, 1966, 1968; Hickrod and Hubbard, 1968; Thomas, 1968; Garms and Smith, 1969; Guthrie, Kleindorfer, and Stout, 1971; Berke, Goettel and Andrew, 1972). Simultaneously the groundwork for a legal revolution against the state fiscal structure based on the equal protection clause of the fourteenth amendment of the U.S. Constitution was being articulated (Horowitz and Neitring, 1968; Wise, 1968a, 1968b; Coons, Clune, and Sugarman, 1969, 1970; Silard, 1970).

"Equalization of what?" is still a very important question. The activity chronicled above on the inequality front has served only to provide alternative responses to this question. As Johns and Salmon (1971) have pointed out, no precise definition of "educational opportunity" much less "<u>equal</u> educational opportunity" has existed now or in the past. In most of

the studies cited previously inequality has been measured in terms of the wealth (variously defined) of school districts, the expenditures per pupil, the educational services provided students (including the quality of staff and the quality of facilities for delivering the services) and the tax effort exerted by citizens to attain the expenditure and service levels.

In more recent years several authors (Coleman, 1968, 1971; Jarret, 1971) have encouraged researchers to go beyond what they consider relatively weak measurements of school "inputs" and to measure instead equalization of "outputs." As statewide assessment and testing continues to spread throughout the United States this becomes more of a possibility. Equalization of school outputs, however, raises quite a number of thorny problems. To accomplish this type of equalization it is necessary to: (a) agree on outputs to be measured; (b) hold constant inputs over which school authorities have little control, and (c) manipulate inputs known to maximize achievement and over which school authorities have control. As a long-term goal of school finance research this type of equalization may be a pearl without peer. Unfortunately it can be doubted whether the present state of the art with respect to "educational production functions" will allow us to really do this in the near future (Barron, 1967; Guthrie, 1970; Levin, 1970). In the meantime we will still probably need studies of "inputs" to monitor our imperfect progress toward equal educational

opportunity.

A second question, "equalization among whom?" while meriting no less attention than the first can be dealt with in less space. The response presented by many of the publications appearing in the last few years is "equalization among different socio-economic classes" (Garms and Smith, 1969; Kelly, 1970). But socio-economic class can be analyzed using several different units of analysis. Until very recently the school finance researcher simply assumed that his "proper" unit of analysis was the school district. That assumption can no longer rest unchallenged. If equalization is to be truly effective it is held now by some that the unit of analysis should not be the school district, but rather it should be the individual school or attendance unit (Levin, Guthrie, Kleindorfer and Stout, 1971). Within larger school districts there can be little doubt that great inequalities exist in educational inputs (Sexton, 1961; Havighurst, 1964; Goettel and Andrew, 1972). If equalization is desired among individual schools then radical surgery will be needed on the grant-in-aid systems of most states. The fundamental record keeping, charts of accounts, etc., would have to be changed since in many states fiscal data by individual attendance units is not at all available.

Perhaps a more serious challenge comes from those who would answer, "equalization among families." To explore this response fully would carry us into a discussion of voucher

systems and far beyond the mission of this paper (Coons, Clune and Sugarman, 1970; Benson, 1971). It is clear, nonetheless, that if society wishes to move in the direction of an educational allowance for individual families and then proceed to use <u>that</u> instrumentality for the equalization of educational opportunity a major institutional reorganization of American education must be undertaken. The debate over whether voucher systems would move society toward equalization, or away from equalization, will likely continue for some time. The use of non-public school aid as an instrument of equalization is explored at some length in Erickson (1967).

In addition to the questions, "equalization of what?" and "equalization among whom?" it is apparent that we also need to explore what is meant by the word "equalization" itself. At first inspection it might seem that the answer was self-evident. Does not equalization simply mean reducing the variation in a set of measurements? Perhaps in a strict mathematical sense this is correct. It appears that in much of the school finance literature, however, the theoretical construct "equalization" has not been used in a univariate sense at all, but rather, in a bivariate framework. Provisionally one might then say that there are at least two responses to the question of an operational definition of equalization. One definition uses variation, but the other definition uses association. Since both variation and association are central theoretical constructs in the discipline of Statistics it will come as no

surprise to learn that there are many possible techniques for measuring these fundamental notions. Likewise, many possible measurement approaches can be made to the matter of equalization. We shall return to the question, "what is equalization?" in a later section of this paper. Prior to that, however, we wish to see if further light can be cast on the definitional problems by the use of model building.

Normative Models

Policy analysis is alleged to entail: (a) the comparison of the "is" with the "ought" and (b) the recommendation of strategies for bringing the former into agreement with the latter. Such well-meant exhortations unfortunately assume that prior empirical research has established rather clearly just what "is" and that also a reasonable degree of consensus exists concerning the "ought." The study of school finance probably currently meets neither prerequisite. Recent judicial developments have encouraged us, nevertheless, to formulate a portion of this examination of the equalization concept in terms of a contrast between "actual" functions versus "desired" functions. These paired functions we have then termed "normative models." Since considerable disputation exists over the shape and nature of both the "actual" and the "desired" functions we offer this exercise primarily to encourage further research and further policy argumentation. Our efforts in this section have been greatly assisted by the

discussion of several verbal models of equality of educational opportunity provided by Wise (1968a; 1968b). Our models have been given the labels, "permissible variance," "inverse allocation," "fiscal neutrality," and "fiscal intervention." The first term is borrowed directly from Wise and the third and fourth terms were suggested by Judge Miles Lord (Van Dusartz v. Hatfield, 1971).

The first model, shown in figure #1, consists of simply plotting the frequency of expenditures, or services, or outputs of school districts for some spatial entity, e.g., a metropolitan area, a state, the United States, etc. In this and all subsequent models the actual function is indicated by a solid line and the desired function is indicated by a dashed line. We are already in trouble with our fledgling models since studies of the shape of these distributions do not seem to have attracted great interest from researchers. More attention has been paid to the expenditure distribution than to the distribution of other variables. The most extensive data comes from Harrison and McLoone (1965). These data indicate that, for a distribution of all school districts in the United States in 1959-60, the median expenditure was reached from the lowest expenditure in thirty equal intervals but that it took thirty-eight more intervals to exhaust the distribution including a large open ended top interval. This study indicates, however, that the shape of the expenditure distribution does vary greatly from state to state. Some years earlier James

(1961, 1963) had noted this same variation in expenditure distributions among states and commented on the skewed nature of many of these distributions. Burkhead (1961) also noted skewness in the distribution of school finance variables within a single metropolitan area. With some reservations then we shall posit the "actual" distribution of expenditures in most states to generally be a distribution skewed in such a manner that there are more districts in the lower end of the distribution than in the upper end of the distribution. With equal tentativeness we shall further argue that the distribution desired by the framers of most equalization grants-in-aid was, and still is, to push the lower end of the distribution to the right, and in the process reduce both the skewness and the variance of the distribution.

The goal of this first normative model, then, is to reduce variation to some "permissible" range. Unfortunately, we do not know just how "permissible" is to be defined except that Wise (1968a) suggests at one point that the courts might not want to allow a high to low range of more than 1.5 to 1.0 should they opt to use this model to judge the equity of state K-12 financial systems. As of this writing we have had no judicial pronouncement equivalent to Judge Skelly-Wright's ruling that there could be no more than a five percent variation between expenditure levels of individual schools within a single school district (Hobson v. Hansen, 1967).

With all these normative models an important question is, "are we moving toward the desired function or away from the desired function with the passage of time?" A suitable answer demands a review of the literature of greater depth than we can give it here. However, we can at least suggest that the answer might depend upon which geographical frame of reference the researcher is using. Harrison and McLoone (1965) concluded that we probably were moving toward greater expenditure equality if the geographic area was the entire United States, or if one was exploring the variation among school districts within a majority of the states. However, these researchers also suggested that progress toward expenditure equalization seemed to have been greater in the 1940's than in the 1950's. Different results may be obtained, however, if the geographic focus of the research is expenditure variation within standard metropolitan statistical areas (Hickrod, 1967; Hickrod and Sabulao, 1969; Lows and Others, 1970), or if the variation is between central cities and suburbs (Berke, 1970), or if the major concern is with different categories of districts within metropolitan areas (Rossmiller, Hale, and Frohreich, 1970).

What are the strengths and weaknesses of this "permissible variance" model? If the distribution under analysis was to be school outputs perhaps measured in terms of achievement test scores and supplemented by some additional measures of school effectiveness it would probably be satisfactory at least to the stronger egalitarians among educational

researchers. But the majority of research using this model has not been done in terms of school outputs, but rather in terms of school inputs. This presents a dilemma. It is at least possible that the reduction of variance in outputs might require an increase of variance in inputs. Without the addition of a wealth dimension it is also difficult to interpret any increase in the variance actually observed. Does such an increase mean the wealthier districts moved further away from the central tendency of the distribution? Does it mean the poor districts did or did not move? None of these matters can be known without abandoning the univariate framework for measuring equalization.

The oldest bivariate model of equalization is the one illustrated in figure #2 which relates general state aid to school district wealth in an inverse fashion. Wealth is usually defined as property valuations per pupil but it can also be defined in terms of income or a combination of property valuations and income. The controversy in school finance circles over the definition of "wealth" or "fiscal capacity" is of long standing (Burke, 1957, 1963, 1967). Some researchers have expressed considerable dissatisfaction over the continued practice of defining "wealth" or "fiscal capacity" solely in property valuation terms (Hickrod and Sabulao, 1969). The shape of the actual general aid function is believed in many states to be a negatively sloping line with a rather sharp breaking point at the range of districts which no longer

qualify for equalization aid but do continue to qualify for flat grants or for guaranteed minimum state aid (James, 1961, 1963). This aid function can probably be approximated by a logarithmic transformation of either the wealth or the aid variable, or both. Curiously, however, while the departure from linearity of the state aid-wealth function has long been known, the curvilinearity of that function has not been taken into consideration when decisions are made concerning appropriate statistical techniques with which to measure the extent of equalization. We shall comment further upon the curvilinear property of the state aid function in the next section of the paper.

Figure #2 is the "conventional" model of equalization, the one most widely recognized among practicing educational administrators (Doherty, 1961). The model has been used for several research purposes. For example, it has been used to study the distribution of funds under several types of state aid formulae (Benson and Kelly, 1966; Sampter, 1966; McLure and Others, 1966; Farner and Others, 1968; Hempstead, 1969; Waren, 1970). It has also been used to study the distribution of state aid among school districts in metropolitan areas at more than one point in time (Hickrod and Sabulao, 1969). Recently this model was used to compare the distribution of funds within states for all fifty states in the Union (Briley, 1971). The general bivariate linear relationship is known to be negative, quite strongly so in some states.

As might be expected there is much less agreement concerning the desired function. Much of the controversy in state legislatures takes place over how steep the slope of the desired function, illustrated by dashed line A in figure #2, will be. In many states, the local districts receive either flat grants or equalization grants, but not both (Johns, 1969). Some authors have held that this practice in fact discriminates against poorer districts and that these poorer districts should receive flat grants in addition to their equalization grants (Coons, Clune, and Sugarman, 1970). Should the flat grant portion happen to be quite large this could result in quite a gain for poor districts as indicated in the dashed line B of figure #2. Johns and Salmon (1971) have constructed a typology for the evaluation of equalization effects built partially upon this inverse allocation model, but with weightings for the proportion of state to local funds, and the degree to which the grants take into consideration variations in local costs. The strengths and weaknesses of the inverse allocation model are entangled with how the model is measured and discussion of this point is therefore reserved to the third section of the paper.

Figures #3 and #4 illustrate two models of equalization of more recent origin. The two-part model in figure #3 which we have labeled "fiscal neutrality" is drawn from the argumentation presented in Coons, Clune, and Sugarman (1970) and also from recent court decisions (Serrano v. Priest, 1971;

Van Dusartz v. Hatfield, 1971). The words of Judge Lord describe the desired function: "Plainly put, the rule is that the level of spending for a child's education may not be a function of wealth other than the wealth of the state" (Van Dusartz v. Hatfield, 1971). One possible interpretation of that rule could be that all funds for K-12 education should be distributed by a very large flat or bloc grant with no local contribution at all from local school district resources. This would result in one type of full state funding. Not necessarily the best type, in our opinion. The desired function resulting from this strong interpretation of the neutrality rule could be represented by the dashed line labeled "A" in figure #3a. It has, however, also been suggested that the courts may not be so rigid in their interpretation of the "fiscal neutrality" doctrine with the result that any state system which makes an honest effort to "level up" its expenditures, while still allowing the wealthier districts to "add on" something from local resources, will be allowed to pass unscathed before the sword of constitutional justice (Greenbaum, 1971). If this milder interpretation proves eventually to be correct then an "acceptable" if not a "desired" function might prove to be something like dashed lines "B" or "C" in figure #3a.

The courts as Wise (1968a) has observed have a strong preference for operating in the negative. "Thou shalt not" is a more comfortable legal posture than "Thou shalt." Bearing

this in mind the neutrality doctrine can be restated to say that no state may operate an educational fiscal system in which expenditure levels are primarily determined by the local wealth of the school district. In other words the courts may be more concerned with the solid line in figure #3a than in any possible dashed lines. Unfortunately that solid line is also the most well researched function in the history of modern school finance. There are literally scores of studies that demonstrate that no matter what variables are placed in multivariate demand models, the wealth of the local school district is almost always the best single indicator of local demand for education (Hickrod, 1971). Surely it is ironical that the United States courts have chosen to attack one of the strongest empirical relationships known to exist among school finance variables. The judicial "lions under the throne" certainly have their work cut out for them.

The second component of the fiscal neutrality model is more difficult to handle. Commentators have pointed out that the courts are less clear about tax inequalities than about expenditure inequalities (Silard, 1971). It appears, however, that the rule might be: "tax rate may not be a function of wealth but it may be a function of expenditure level." If that is a correct interpretation then the vertical dimension of the model is not simply tax rate but rather tax rate adjusted for differences in expenditure level. The desired function again would appear to be the straight line similar

to the line in the first component. This is illustrated in figure #3b. With respect to the actual function we can only speculate. The simple bivariate relationship between wealth and tax effort is negatively sloping in some studies (Berke, Goettel, and Andrew, 1972); however, this is not so clear in other studies. In the absence of proof to the contrary, it might be assumed that once a control has been effected for expenditure levels the sign of the slope might remain negative, but the magnitude of the slope would decrease sharply.

The last normative model also consists of two components. In recent years the number of academicians willing to state, sometimes in a rather forceful manner, that American society should be spending more on the education of children from poor families than on the education of children from wealthy families has increased (Guthrie, Kleindorfer, Levin, and Stout, 1969; Levin, Guthrie, Kleindorfer and Stout, 1971). A related and perhaps even larger body of analysts have stressed the great educational needs of the poor, particularly the needs of the urban poor (Berke, Goettel, and Andrew, 1972; Kelly, 1970; Garms, 1969). In most cases the raison d'etre for this type of allocation pattern is sociological or socio-political in nature; i.e., to reduce social stratification and increase social mobility (Hickrod and Hubbard, 1968). It is further argued that this type of allocation pattern should produce a situation in which educational achievement should be substantially equal among socio-economic groups by the end of the

K-12 experience (Coleman, 1968). This school of thought, which we have termed "fiscal intervention," has been illustrated in figures #4a and #4b. Obviously it is closely related to compensatory education and could just as easily have been termed compensatory finance.

In figure #4a we have a situation which would exist if Judge Lord's decision had read, "the rule is that the level of educational achievement may not be a function of wealth other than the wealth of the state." We hasten to remind the reader that the justice from Minnesota did not say this and in fact, at least to our reading of the 1971 cases cited earlier, none of these decisions has gone this far. Therefore one might think of this as a "beyond Serrano" policy position. The actual functional relationship between educational product (usually measured as educational achievement) and wealth is fairly well documented in school finance research (Benson, 1965; Burkhead, 1967; Dunnell, 1969; Van Fleet and Boardman, 1971), although the number of research studies on this topic does not begin to equal the number of research efforts directed toward exploring the relationship between expenditures and local wealth. The normative model resulting from the juxtaposition of the desired function with the actual function is similar to model #3a, and much of what was said of model #3a also applies to model #4a.

In model #4b the actual function is the same as in model #3a. The desired function is subject, however, as are all the

desired functions discussed in this section, to considerable uncertainty. If more should be spent on the poor, how much more? The most common parameter given is that twice as much should be spent on the poorest district as is spent on the wealthiest district (Guthrie, Kleindorfer, Levin, and Stout, 1969). The desired function could take other values. For example, the program cost differentials for compensatory programs relative to standard programs provided by McLure and Pense (1970) suggest a 1.68 ratio for grades 6 and below, and a 1.83 ratio for grades 7 through 12. If, for the purposes of this general discussion, one assumes that no compensatory students are present in the wealthiest district and that the poorest district contains nothing but compensatory students, and if one further assumes that the presence of compensatory students is a direct inverse linear function of wealth, then the desired functions are those indicated by dashed lines A, B, and C in figure #4b. McLure and Pense (1970) dichotomized compensatory programs treating the detention schools for severely maladjusted as a separate and much more costly program category.

An important concern here is whether one of these models, specifically the fiscal neutrality model, precludes and prohibits the adoption of the other models. Does the emerging judicial doctrine of fiscal neutrality, e.g., the quality of a child's education may not be a function of wealth other than the wealth of the state, render illegal and inoperative the

permissible variance, inverse allocation, and fiscal intervention models? We believe it does not. The fiscal neutrality doctrine would appear not to apply to the inverse allocation model since it addresses itself to the total expenditure-local wealth function rather than to the state aid-local wealth or the federal aid-local wealth relationships. Nor does it appear to apply to the permissible variance model since the variance may, or may not, be connected with wealth differences.

The fiscal intervention model presents a more complex problem. The courts have never really indicated just what they mean by the word "function." Ultimately the word may need to be defined in future litigation with the aid of expert testimony from mathematicians and statisticians. For the moment it may suffice to say that when used by the layman without an adjective it usually means a positive or direct relationship rather than an inverse or negative relationship. The argumentation flowing from the lack of equal protection due to indigence in some of the cases cited by the courts suggests the thinking is in simple rectilinear terms; i.e., the more wealth the more services and the greater protection versus the less wealth, the less services, and the lesser protection. Since the actual function of total expenditure and local wealth in no way approaches an inverse function in the United States, the point may be purely academic. Should it ever arise in actual litigation, however, it might be argued that in the fiscal intervention model the wealth variable is really acting

as a substitute for a needs vector. The courts have demonstrated that they have no desire to try to handle the needs concept in these school finance cases (McInnis v. Ogilvie, 1969; Rodriquez v. San Antonio, 1971). This does not mean, however, that they would not accept the more measurable and more justiciable wealth variable as a substitute for educational needs. The only assumption necessary is that poor children are educationally needy children.

Throughout this discussion of normative models we have merely indicated the desired and actual functions to be either linear or curvilinear functions of wealth. We have not indicated how such functional relationships might be measured. Such an omission causes no problem for general theoretical discussion. However, the empirical investigation and evaluation of state educational fiscal policies requires much more attention to operational definitions and to measurement techniques. Without work at this level of definition the full meaning of the equalization concept would continue to elude our grasp. To that task we now turn.

Measuring Equalization

Measurement problems can be discussed in a fashion similar to the normative models; that is, in univariate or in bivariate mode. In the univariate mode the researcher is often measuring variation in expenditure per pupil among districts. Variation could also be measured in terms of fiscal capacity

or with respect to output or services provided if these data were available. The methodological question here is variation from what? The conventional answer has been variation from the mean of the set of measurements being examined. Hence the variance (the mean squared deviation from the mean) has been used. Since relative variance is frequently of concern the square root of the variance, the standard deviation, is often expressed as a percent of the mean. This descriptive statistic is sometimes referred to as the "coefficient of variation" (James, 1961, 1963). On occasion, a somewhat less exact statistic based on the difference between the first and third quartiles, the interquartile range, is used. Again, since relative variation is of interest the ratio of the interquartile range to the median is used (Harrison and McLoone, 1965).

There are two limitations on these procedures. In the first place since we have reason to believe that these distributions may be skewed, a change in the shape of the distribution may be more revealing than a change in variation. Secondly, both these techniques depend upon the assumption that the variation of interest is that measured from the central tendency of the distribution. In the light of the influences discussed in the first two sections of this paper it might be more appropriate to measure variation, not from central tendency, but from a condition of perfect equality.

One straightforward measure of variation from equality is simply the mean deviation from equal expenditure, or equal property valuation, etc., or the mean square deviation from this benchmark (Johns and Others, 1971). There is, however, another technique available which has the advantage of having both a graphical and a numerical representation. This is the Lorenz curve and an associated numerical expression, the Gini index or "index of concentration." This latter measure of deviation from perfect equality has frequently been used in economics (Morgan, 1962) and somewhat less frequently in sociology (Duncan and Duncan, 1955), biology (Duncan and Duncan, 1957), and political science (Alker, 1970). In only a few instances does it appear in school finance literature (Harrison and McLoone, 1965; Hickrod, 1967).

When using the Lorenz curve and Gini index in a univariate mode, a rank order of districts from that district having the least expenditure to that district having the greatest expenditure is formed. A Lorenz curve is a plotting of the cumulative proportion of districts against the cumulative share of aggregate expenditure accounted for by these districts. If all districts had the same expenditure per pupil a 45 degree line would result as indicated in figure #5. Fifty percent of the districts would then account for fifty percent of the aggregate expenditures and the line would pass through point A. However, if fifty percent of the districts spend only twenty-five percent of the aggregate expenditures

a curve is formed passing through point B. As districts depart from perfect equality the curve departs from linearity, moving to the right.

While the Lorenz curve is a good graphic device one needs a numerical value to assign to it. Basically, the area between the diagonal and the curve represents the amount of inequality and this needs to be expressed relative to the area of the triangle formed by the diagonal. Appendix A displays a mathematical development of a formula starting from this assumption and concluding with the following computational formula:

$$G = \sum_{i=1}^{n} (X_{i-1} Y_i - X_i Y_{i-1})$$

where: x = cumulative proportion of districts

y = cumulative proportion of expenditure (state aid, achievement score, etc.)

As the curve moves away from the diagonal the magnitude of G will increase. Therefore, in this particular mode, low magnitudes of G indicate equalization and high magnitudes of G indicate disequalization.

The principal problem in the bivariate mode centers around the extensive use of the Pearson product moment linear correlation coefficient. Although there are a large number of studies in circulation which use this descriptive statistic, it has some serious limitations for measuring equalization. In the first place this correlation coefficient measures only the

strength of the linear relationship. If the relationship is non-linear as is the case with the relationship between state aid and wealth of the district, use of the correlation coefficient is not appropriate. Secondly, even if the assumption of linearity holds, the correlation coefficient cannot measure the slope of the line. For example, a high correlation between expenditure and wealth of the district indicates the existence of linear relationship between these two variables, but it does not show how much the expenditure changes with a particular change in wealth (Tufte, 1969). One must perform a regression analysis to find the slope of the line. The third limitation is the effect of extreme measurements on the correlation coefficient. Only a few districts receiving large amounts of state aid may affect the value of the coefficient drastically. The fourth limitation springs from the fact that each district has the same weight in affecting the magnitude of the correlation. The smallest district in Illinois, for example, has the same weight as Chicago. This limitation, however, could be overcome by weighting the data before computing the correlation coefficient. Given these limitations we are inclined to discourage the use of Pearson product moment linear correlation coefficient in the measurement of equalization.

What then can be substituted for the correlation coefficient? Graphic profiles are effective but they do not yield a single numerical value which can be used to describe

equalization within a state (McLure, 1964, 1966; Briley, 1971). Barkin (1967) and Wilensky (1970) have suggested a second usage of the Lorenz curve and Gini index that looks promising. This technique is illustrated in figure #6. Although there are only two dimensions visible on the graph, there is a third hidden dimension. The three variables considered are as follows:

(i) Units between which equalization is to be achieved, e.g. pupils, districts, state, etc.

(ii) Criterion for differentiation between these units, e.g. wealth, income, size, etc. The data are ranked in increasing order of this criterion.

(iii) Factor that is to be equalized, e.g. state aid, expenditure, achievement score, etc.

In figure #6, the vertical axis represents the cumulative proportion of students ranked by wealth and the horizontal axis represents the cumulative proportion of state aid. In this usage should each district receive the same amount of state aid, e.g. a condition of flat grants without weightings, fifty percent of the students ranked by wealth would receive fifty percent of the state aid and the line would pass through point A. However, should aid be distributed in inverse proportion to wealth, then fifty percent of the students ranked by wealth might receive seventy-five percent of the aid and the curve would pass through point B. The Gini index takes a value of zero in case of flat grants but has a positive value between

zero and one for any other state aid formula that tends to help the poor districts. The higher the magnitude of the Gini index, the more favorable is the distribution of the state aid for the poor districts.

The real strength of this technique lies in its ability to compare the disequalizing effects of local resources with the equalizing effects of state aid. Figure #7 highlights the disequalizing effects of local resources. It should be noted that in this figure the curve is above the diagonal and that the Gini index is negative. This is due to the fact that the wealthy districts raise more money through local resources than do the poor districts. Figure #8 shows the combined effect of local resources and state aid. The curve is still above the diagonal and the Gini index is still negative but smaller in magnitude. This means that the equalizing effect of state aid does not completely balance the disequalizing effect of local resources.

Another use of the Lorenz curve is in exploring the equalizing effects of variations in many different parameters in the general aid formula. This usage is illustrated in figures #9 and #10 using Illinois data for the year 1968-69 for unit districts (K-12) of that state. The calculations in this example are based on a "pure" foundation or Strayer-Haig formula and the effects of various Illinois adjustments that exist are not shown here. In this example the flat grant is not taken into consideration. Lorenz curves are drawn for

three levels of qualifying tax rate and two levels of foundation level. As can be seen from the diagrams, with the foundation level at $520 and the qualifying tax rate at $1.08 the Gini index stands at .096 (figure #9). Should the foundation level be raised to $600 and qualifying rate remain at $1.08 the index falls to .077 and the curve moves near to the 45 degree line (figure #10). However, should the foundation level be raised to $600 and the qualifying rate also be raised to $1.36 the index rises to .111 and the curve moves away from the diagonal (figure #10). It should be noted that raising the qualifying rate while holding the foundation level constant results in higher Gini index meaning greater equalizing effects of the state aid.

From these illustrations it should be clear that the Lorenz curve has many advantages over other existing methods of measuring equalization. As described in the first example, the Lorenz curve allows three variables to be considered in one graph. Secondly, no assumption as to the linearity of functions is involved. This makes it applicable to both linear and non-linear situations. The whole graph can be reduced to one number--the Gini index--for comparison purposes. This technique is equally applicable to different definitions of equalization.

The measurement of equalization is surely a topic worth greater development by researchers. However, we do not wish to leave the impression that this subject is so esoteric that

it yields only to investigation by measurement specialists. Simple percentages can often be revealing. For example, using 1971-72 state aid information in Illinois one can discover that the poorest half of the elementary students in that state receive approximately 63 percent of the funds going to all elementary schools. The poorest half of the high school students receive approximately 65 percent of the funds going to high school students. However, the poorest 46 percent of the students in the unit districts (K-12) receive only 50 percent of the funds going to students in all unit districts. This situation exists due to the fact that the almost one half million students in the city of Chicago school system are considered in the top half of the wealth distribution in terms of property valuation used for the calculation of 1971-72 state aid. As Berke, Goettel, and Andrew (1972) have pointed out, neither Chicago nor a great many other central city school districts will receive very much state aid as long as the measurement of wealth or fiscal capacity remains property valuation per pupil.

Application

State educational administrators, particularly those who are facing a court ordered revision of the fiscal structure of their state, are apt to be much more interested in the application of the concept of equalization than with efforts at more precise definition and measurement. It is toward this

pressing practical problem that we direct our remaining comments.

The question we shall attempt to answer in this section is simply, "what policy and administrative alternatives does a state have if a major commitment has been made to provide more funds to students in the poorer districts of the state?" The possibility of such a commitment depends upon the political and social composition of each individual state. We think it realistic to assume, however, that more state departments of education will be interested in seeking answers to this question in the near future. Some state departments have already indicated the high priority they intend to give to actions which will increase equal educational opportunity (Bakalis, 1972). It remains to be seen whether state legislatures will concur on the priority to be assigned to increasing equalization.

The actual allocation patterns brought about by the alternatives described in the following paragraphs should be evaluated in terms of the normative models of equalization previously discussed in this paper. Very likely some of the quantitative approaches mentioned in the preceding section would also be utilized in this evaluation process. Although it is our view that the federal government does have a responsibility to help the states achieve equalization within their boundaries we shall restrict our commentary here to those strategies and tactics that can be carried out by state

departments and by state legislatures without federal assistance. There would appear to be four of these overall or general strategies: (a) full state funding, (b) district reorganization and consolidation, (c) manipulations of general purpose grant-in-aid systems, and (d) utilization of certain types of categorical grants. Each will be discussed in turn.

The heart of the equalization problem lies in the American practice of using unequal local resources to support education. It is therefore quite tempting to consider cutting the Gordian Knot by supporting K-12 education entirely from state taxation with no local contribution being allowed at all. State assumption or "full state funding" is not a new idea in school finance (Morrison, 1930). It is fair to say, nevertheless, that this proposal has gained more supporters in recent years than was the case in past decades. It should be noted that many modern proposals for full state funding are not really "full" at all in the sense that they do not contemplate 100 percent state funding. Provision is usually made for the addition of certain funds derived from local taxation to be laid on top of the state support. The crucial point here is that these local "add ons" are relatively small and strictly supervised. The controls on local contributions can be a flat rate such as 10 percent of the state grant (ACIR, 1969; Milliken, 1969) or the controls can be in the form of more elaborate schemes by which districts may tax at different rates depending on the support level they have selected for

their children. Some of these latter plans provide that if the controlled local tax yields an excess over a specified figure the balance of the yield must be surrendered to the state for distribution to less fortunate districts (Green, 1971). These proposals are frequently based upon ideas advanced by Coons, Clune, and Sugarman (1970) and therefore collectively might be referred to by the term they used, i.e., "district power equalization."

Since there are tight controls on local contributions and the state share of K-12 support is very large, if not actually 100 percent, the manner in which the state allocates these funds becomes even more important than it is under present partnership arrangements by which both the state and the local governments provide funds for public education. Several alternative methods of allocation under full state funding are possible. We shall mention only a few of these. James (1972) favors a distribution scheme based upon individual educational programs, essentially working a planning-programming-budgeting approach into the allocation process. This would make the K-12 allocation process not greatly different from that allocation process used in higher education in many states. Benson (1971) suggests that aids-in-kind provided by intermediate districts or regional service centers accompany the general purpose bloc grants and that much of the aid to poor districts be channeled through this aid-in-kind approach.

Johns and Others (1971) have demonstrated that as the percentage of state aid rises and cost differentials for special types of educational programs such as compensatory education, special education, vocational education, etc. are used as student weightings, large bloc grants can deliver a considerable amount of funds into poor districts without explicitly taking into consideration differences in local school district fiscal capacity. As state aid approaches 90 percent they report little difference between the large bloc grant approach and the more traditional grant-in-aid formulae.

A full state funding arrangement which allocated funds on the basis of very large bloc grants per student and which further weighted these students on the basis of program cost differentials would, in our opinion, contribute to the equalization of educational opportunities. Such a scheme might also be very well received by the courts. Unless one is willing, however, to accept a considerable error variance in the accuracy of these student weightings, such an approach does require a good unit cost study in the state which is considering the adoption of such an approach to K-12 allocations.

Full state funding, or even any of the various proposals calling for "almost" full state funding, would require a considerable increase in state revenues. Realizing this, full state funding advocates usually also recommend that the state governments enter the property tax field once the local educational special district government has no need of this revenue

source for educational purposes. It has also been suggested (Thomas, 1968; Walker, 1961) that it might be possible for the state to assess and tax only certain kinds of property, such as industrial and commercial valuations, leaving the residential valuations to local tax collectors. To ascertain the impact of such a scheme one needs to collect data on the distribution of various types of property valuations i.e., industrial, residential, commercial, among local school districts. While these data are often available by counties, only a few researchers have been able to assemble it by school districts (Harvey, 1969).

A second general strategy is to encourage local district reorganization and consolidation in the hope that this will eliminate small districts with inadequate local tax bases. Consolidation can, indeed, make a meaningful contribution to the equalization problem, but only if wealthy and poor districts are found in relatively close proximity to one another. No giant strides are made toward equalizing educational opportunity by the merging of a number of equally poor school districts. Unfortunately, in some of our larger metropolitan areas, districts do tend to form separate sectors of affluence and disadvantagement (Hickrod and Sabulao, 1969). Reorganization can also make a meaningful contribution to equalization provided the new intermediate districts, which are usually part of most reorganization plans, are provided with the facilities to aid poor local districts within their

jurisdictions. Since a proper exposition of consolidation and reorganization matters take more space than can be allowed here we shall discuss this strategy no further. It should be pointed out, in any event, that consolidation and reorganization are often advocated, not on equity or equalization grounds at all, but rather on grounds stressing the efficient allocation of resources and the minimization of costs relative to scale of operations (Egelston, 1969; Thomas, 1971; Hooker and Mueller, 1970; Hickrod and Sabulao, 1971).

Despite the obvious attractions of full state funding for equalization of educational opportunities, and notwithstanding impressive academic support for this position, we feel that at least in the immediate future many states will continue to retain some type of joint state-local fiscal arrangements for K-12 education. We base this estimate on five considerations. First, the expense connected with moving to full state funding, or even "almost" full state funding, is such that it would necessitate the adoption of new taxes in some states and/or a considerable increase in rates on existing taxes in many more states. Second, the notion of full state funding for K-12 education raises serious questions concerning the funding of other very important public services at the state level. With budgets in all states quite tight, full state funding for K-12 education would mean much greater difficulties in funding other needed public services such as welfare, health, transportation, police, etc. It will also not be overlooked by

junior college administrators that full state funding of K-12 might curtail their very rapid growth and it will certainly not be overlooked by university-based researchers that full state funding of K-12 might well mean an even further tightening of college and university budgets. Third, full state funding will also be opposed by both professional educators, laymen, and legislators who continue to sincerely believe in the benefits long alleged to adhere to local control of the K-12 educational jurisdiction (Ross, 1958). This is true even though it is difficult to rigorously prove that these benefits do, in fact, exist. School board associations are skeptical of a change in institutional structure that might reduce their sphere of decision making and it is not at all clear that state teacher organizations will support a system that places teacher negotiations at the state level. Fourth, the notion that "lesser associations" as de Tocqueville termed them, can operate both in the public sector as well as in the private sector to provide benefits to their members not provided to the general population is deeply ingrained in American custom and tradition if not in constitutional law. Such a tradition will not be summarily abandoned. Finally it will surely not be easy to erase over seventy-five years of educational fiscal history in the United States, no matter what the judicial pressures to do so.

Rather than an immediate adoption of full state funding what we think is more likely, and certainly more politically

acceptable, is an acceleration of the state share of support for the K-12 jurisdiction and a reduction of the local contribution. It should be noted that this increasingly rapid shift to more state aid may be caused, not by any great desire to achieve equal educational opportunity, whether court mandated or not, but by the desire of much of the electorate to move some of the tax burden from the local property tax to the state sales tax and the state income tax. The judicial demand for equal educational opportunity may simply provide the escape valve for a property tax pressure that has been building up for some time.

The anticipated increase in state funding will likely be used to "level up" the educational offerings of the poorer school districts. There appear to us to be at least two different tactics within the overall strategy of manipulating the general purpose allocation system. One of these has already been alluded to in the discussion of full state funding. It is certainly possible to "level up" the educational offerings of the poorer districts by large general purpose bloc grants distributed on a weighted student basis and with some provision for limited local "add ons" from local revenue sources. While this notion has been circulating for some time in school finance circles we feel that not enough research has been done on the relative advantages and disadvantages of weighted bloc grants versus conventional grant-in-aid formulae. A second, and more familiar tactic, is the manipulation of the existing

grant-in-aid formulae that now distribute funds from the state to the local levels. The heavy hand of history being what it is we suspect that the manipulation of the existing formulae will be tried first, and then only secondly will more unconventional methods be adopted if the formulae manipulation proves inadequate to meet court mandates. On that assumption we shall devote the next several paragraphs to the somewhat esoteric subject of manipulating educational grant-in-aid formulae.

There have been three types of general purpose educational grant-in-aid formulae in use in the United States since the mid-sixties. The terminology is unfortunately not standardized among fiscal researchers but the labels most commonly used for these formulae are: (a) Strayer-Haig or foundation level, (b) percentage equalizer, and (c) resource equalizer or guaranteed valuation. There are several specific treatments of the strengths and weaknesses of each of these types of grant-in-aid approaches available in school finance literature (Benson, 1964; Cornell, 1965; Hubbard and Hickrod, 1969; Johns and Others, 1971). In addition almost any standard school finance textbook feels constrained to offer many pages, sometimes whole chapters, on these grant-in-aid forms (Benson, 1968; Johns and Morphet, 1969; Garvue, 1969). Other methods of allocation, for example, the application of linear programming techniques, have been suggested (Bruno, 1969), but they have not won legislative acceptance. Appendix B provides a

very simple statement of each of the three major formula types used in the United States. It should be pointed out that almost every state has now made many modifications in the particular formula they have adopted. These modifications are the result of compromise between the political forces at work in all state legislatures and in the various committees and commissions that recommend financial legislation for adoption.

The important point we wish to stress here is that any one of the three formula types now in use can be manipulated to provide a considerable amount of state aid to poor school districts, and, conversely, any one of the three can be manipulated to provide a very modest amount of assistance to poor school districts. It is true that school finance researchers have speculated, and will continue to speculate, as to whether one of the three forms might tend, in the long run, to provide more aid to poorer districts than the others, and there has been some investigation to try to establish this fact (Benson and Kelly, 1966; Johns and Others, 1971). However, we tend to concur with Coons, Clune, and Sugarman (1970) that the more important consideration is the manipulation of the formula rather than the general type of formula that has been adopted. The pattern of monies allocated to local school districts has historically been a result of compromises within legislative bodies and between the legislative and the executive branches of state government. It now appears the judicial branch has also decided to take a seat in this formulae game.

Bruno (1969) is correct in his judgment that these grants-in-aid systems are nothing more than simplistic mathematical functions consisting of a few constants and a number of variables. Since they are simple functions of this nature one can either manipulate the constants, manipulate the variables, or manipulate both constants and variables. By far the most common method of manipulating the variables is by adding weightings to that variable which is used to measure the number of students in a local school district. The trend in this direction was established some time ago by the late Paul Mort and his associates (1960). The distribution of money, of course, can be effected by weighting variables in the formulae other than pupils. We shall describe the manipulation of constants in each formula type first, and then proceed to the topic of manipulation of variables. It may be useful for readers not familiar with these formulae to consult appendix B as the discussion unfolds.

The foundation or Strayer-Haig formula has two constants: (F) the expenditure per pupil established as a "floor" or "foundation" for educational services, and (r) the required tax rate (see appendix B). In a broad public finance sense this kind of grant-in-aid is related to notions of minimum wages, guaranteed family income levels, and other "minimum" social welfare concepts. Professional educators have strenuously tried to escape from this "minimum" aspect of the Strayer-Haig system by stressing the need for a "quality"

foundation level that is considerably higher than any "minimum" notion (McLure and Others, 1966). The second constant (r) is variously called the "qualifying rate," "mandated tax rate," "state charge back," and "state computational rate." The legal aspects of this tax rate differ from state to state and account for some of the difference in terminology. In all states, however, which use this particular formula, the rate sets the amount of local contribution needed to support the foundation level.

State aid can be directed to poorer districts under a Strayer-Haig formula by increasing the magnitude of both constants. Unfortunately, what tends to happen in many states is that (r) is not increased at the same rate as (F). In the past some state legislators have been reluctant to raise the tax rates in the formula on the grounds that effort should be determined in the local districts rather than at the state capital. There has also been a problem of conflicting local tax ceiling legislation. The necessity of manipulating both constants, e.g., (F) and (r), is one of several weaknesses of the Strayer-Haig approach. For these and other reasons it is not uncommon to find both constants kept at very low levels despite the fact that educational costs continue to rise. When this occurs, regardless of why it occurs, the result is to provide less funds to the poorer districts.

The percentage equalizer has the advantage of having only one constant to manipulate, e.g., the .5 which establishes the

amount of state and local contributions in the district of average wealth. As this constant is lowered more funds are directed toward poorer districts. When the parameter is raised less funds are provided poorer districts. What frequently happens to this type of formula is that (E) the local expenditure per pupil has a low ceiling placed upon it. This is often done out of a fear that local school boards will authorize excessive frills which, under the workings of the formula, the state will have to also support. A more important concern in recent years has been that under a percentage equalization formula the state will share in the results of all local collective bargaining with teachers. In very poor districts it would be true that under percentage equalization the state would be picking up most of the costs of teacher organization agreements. Some state legislators have therefore felt that local boards situated in poor districts might commit the average state taxpayer to more than he really wishes to be committed to relative to teachers' salaries.

When ceilings are placed on percentage equalization formulae, for whatever reasons, the effect is to convert the equations into distribution systems not greatly unlike the Strayer-Haig formula. The lower the ceiling the less the funds directed to poor districts. Percentage equalizers also are sometimes accompanied by legislation which specifies that districts will receive a certain guaranteed amount irregardless of what the formula computation produces. This is

equivalent to a flat grant and has the same anti-equalization effects. It should be noted parenthetically that very large bloc grants and conventional flat grants do not have the same effects. As previously mentioned very large bloc grants have the power to equalize upward while flat grants used in conjunction with conventional grants-in-aid formulae naturally disequalize.

All three formulae indicated in appendix B can be rewritten to provide greater equalization. Taking the percentage equalization formula as an illustration, one can drop the .5 entirely from the expression and change the V-subscript-s to a V-subscript-g; that is, form a ratio between the local district valuation and a valuation guaranteed at a much higher level than the state average. Such a formula will have much stronger equalization effects. It is also possible to operate a sort of split-level foundation approach with one foundation level much greater than the other. When this is done the intent is usually to bribe the local districts into doing something that allows them to qualify for the higher foundation level.

The resource equalizer also has only one constant to manipulate, e.g., the V-subscript-g, which is the guaranteed valuation. The higher this guarantee is set the more funds are distributed to poor schools. The lower it is set the less funds go to poorer schools. Of course, the higher the guarantee the more the state revenue needed to flow through this

particular allocation system. States desiring to explore this particular system should watch for some peculiar effects of (r) the local tax rate. In the first place districts which are property wealthy, for example, industrial enclaves, will have low tax rates for education and hence receive little state aid. Unfortunately these districts are frequently inhabited by low income families who have never taxed the wealth available to them. It may be that this low tax effort is due to a low priority placed on education, but it could also be due to inability to contend on an even basis with local industrial giants for control of the school board. In all these allocation systems the state must guard against systematic underassessment of local property in order to qualify for greater state aid. Perhaps this danger is even more pronounced in the resource equalizer since there is, in effect, a double reward for underassessment; once in the difference between the state guaranteed valuation and the local valuation, and then again in the resultant higher tax rate which occurs from the underassessment. Proponents of reward for local effort, or of local control, may still find this formula attractive, however, for other reasons.

One of the most straightforward ways to direct state money into poor districts through the manipulation of variables is to enter an income measurement into any of the three formulae. This can be done in various ways and defended on various grounds. For example, an income measurement can be

used to weight students on the grounds that low income students have greater educational needs than students coming from districts dominated by high income homes. It is also possible to weight the property valuation variable on the rationale that a good measure of wealth or fiscal capacity in modern urbanized society should include more than simply property valuations. There are also several possibilities with regard to the kind of income variable that might be used. For example, it is possible that a variable measuring average income in a district, for example median family income, will not provide as much of a distribution to districts with serious poverty pockets as will a variable measuring a portion of the income distributed in a district, e.g., percentage of families or students below a given income level. The problem here is that the family income distribution in many school districts is thought to be highly skewed although little research seems to exist on this point. In spite of the fact that most states have now adopted a state income tax it still seems difficult in many states to get good income data. School district income data derived from census sources is useful for general research purposes (Stollar and Boardman, 1971), but not accurate enough for use in state allocation formulae. In many states, however, a large number of variables which are known to correlate highly with income can be added to formulae with allocation results not greatly different than those that would be obtained if the income variable itself were used.

A number of these income correlates are also the variables that, when added to almost any formula, will deliver aid into large urban school districts (Berke, Goettel and Andrew, 1972). For example, adding the aid to dependent children count to the formula will assist central city school districts. Another approach is to add a density variable to the formula. If the intent is to aid the poorer districts this should be a true density measurement; that is, pupils divided by square miles. While size, that is, simply the number of pupils, is correlated with lack of wealth, the relationship is not nearly as strong as that between density and poverty. Achievement test scores are also correlated inversely with wealth and therefore if the results of state-wide testing or state-wide evaluation are incorporated into the allocation formula the poorer districts will be aided. Such a practice is open to the charge that the state would be assisting inefficient school districts as well as poor school districts. Garms and Smith (1969) have therefore outlined an ingenious scheme for using, not the actual achievement test scores, but rather the achievement scores predicted by the presence of social variables associated with low achievement. Such a scheme also has the potential for rewarding very efficient school districts. Adding a municipal overload variable, that is a variable measuring the amount of load on the local tax base from non-educational public services, will also aid the poorer districts (Lindman, 1964; Peterson, 1971). The most common method

of doing this is by deflating the property valuation by an index relating educational revenue to non-educational revenue.

Urban school districts must operate a number of high cost programs to meet the needs of their heterogeneous student populations. Many of these high cost programs are related to the incidence of low wealth. In fact, it may be argued that many of the wealth variables are but indirect measurements of educational needs and that the differential cost approach is a more direct method of approaching individualized educational needs than are the wealth variables (McLure and Pense, 1970). Of course some programs, for example programs for gifted children, are probably inversely correlated with poverty and disadvantagement. A change in the method of counting pupils, from average daily attendance to average daily membership, will also assist urban districts since poor districts have greater truancy rates. A more drastic move would be to drop the student measurement entirely and substitute a per capita approach. There is some precedent for doing this since other non-educational grants are distributed on this per capita basis. Such a move would aid urban districts that have been losing pupils to the suburbs.

As can be seen the number of variables that can be added to any formula and the number of manipulations that can be performed on these equations is extensive. The real question then is not how poor districts can be aided, but whether there exists a political consensus to do the thing in the first

place. In this connection students of the politics of education might find it profitable to speculate on the fact that at least a good number of the manipulations we have outlined can be expected to assist not only urban districts but poor rural districts as well. Almost a decade ago McLure (1962) observed that formula weightings tended to aid central cities and rural areas more than suburbs and independent cities. Rural-urban, upstate-downstate coalitions are difficult to achieve and maintain but it is clear that both rural and urban areas have much to gain in any state department or legislative actions taken to strengthen equal educational opportunity. Affluent suburbs of course have much less to gain by any state department or legislative adoption of the equalization goal. All this was true prior to the advent of the recent court cases, and it may be that the recent actions of the judiciary will only serve to catalyze latent political combinations that have been present in public education for many years.

The final overall or general strategy consists of giving poor districts assistance through categorical or special purpose grants. For example a growing number of states do operate their own compensatory education programs in addition to the federal title I, ESEA, program (Burke, 1969). It is also true that vocational grants tend to place an appreciable amount of funds into the poorer districts. Although it does not occur in all instances, almost any categorical grant can be manipulated so that the categorical or special purpose

grant also directs more funds into poorer districts than into wealthier districts. For example, the grant for transportation in Illinois is written so that the poorer rural districts receive more than do the wealthier rural districts.

Many educational fiscal analysts have something akin to a chronic allergy toward large numbers of categorical or special purpose grants. In the first place these grants tend to so complicate the fiscal structure that it is difficult to analyze the total state educational fiscal picture. In the second place there is some evidence that the overall effect of all categoricals taken together is probably disequalizing rather than equalizing (Briley, 1971). In the third place the overhead costs relative to scale of operations make many categorical grants economically inefficient. Fourthly, the amount of red tape and administrivia attached to some of these grants is discouraging, especially to the smaller and poorer school districts. Finally such grants reduce the local administrator's area of discretionary authority to act in such a way to achieve the most efficient allocation of resources. The standing of special purpose or categorical grants among some educational fiscal analysts is probably just about equivalent to the low esteem of earmarked taxes among general public finance analysts.

One cannot be sure, however, that state legislatures will allow professional educators to indulge their allergy to categoricals. In the first place many legislators feel that

categorical grants may be the only way of "seeing to it that the funds are spent the way we intended for them to be spent." This may be true; however, the matter of discerning legislative intent from some of the existing categoricals is not easy. As with all other legislation the language of the special purpose bills is a result of compromise and that compromise, while necessary, does not generally contribute to administrative clarity. In the second place special purpose grants often carry with them specific provisions for evaluation of the programs they fund. This tendency is present in many federal special purpose or categorical grants and similar provisions have been written into some state categoricals. Until educators are willing to accept state-wide testing, evaluation, and accountability, the state legislatures may well find the evaluation provisions of the categoricals to their liking and retain them on these grounds alone.

The Courts

What we have offered here is a treatment of the equalization concept based upon an integration and critique of school finance research. We did not intend, nor are we indeed qualified, to offer a legal analysis. We hope, however, it will not be judged too presumptious to conclude this study with an expression of opinion concerning the role of the courts.

It is currently fashionable in certain educational circles to complain about the alleged desire of the courts to "run the schools." It is also popular in certain legislative circles to declare loudly against the alleged judicial encroachment upon legislative prerogatives relative to public policy decisions in education. In our opinion the judicial branch could not and can not escape the responsibility for evaluating the operation of the public schools in terms of basic principles of both constitutional and common law. To do otherwise, to turn a blind eye upon the rights of parents and children as they interact with the largest of our public bureaucracies, would be to make a mockery of the independent judiciary and the fundamental notion of separation of powers. Evaluation, however, as every student of educational research is taught, assumes valid criterion measurements. To put the thought in terms more comfortable to the legalists, a justiciable standard must be found. In this paper we have argued that justiciable standards can be explored by constructing normative models consisting of contrasts between desired functions and actual functions. There are certainly other approaches to constructing justiciable standards. We have some evidence that the courts are not only willing to listen to such inquiries, but indeed are desirous of having them presented.

The gratuitous warning we would offer the judiciary is simply this. The search for evaluative standards which are

amenable to judicial inquiry is certainly enough of a burden without also attempting to take on the task of spelling out in detail all of the fiscal techniques necessary to come into compliance with a given court order. We do not therefore believe that the courts should attempt to spell out the details of the relief to be provided to plaintiff in these class action finance suits. We note that Judge Lord (Van Dusartz v. Hatfield, 1971) and Judge Goldberg (Rodriquez v. San Antonio, 1971) appear to concur with this point of view. An order that relief should be forthcoming from the executive and legislative branches, and a continuation of jurisdiction until that relief is forthcoming, should be enough to meet the demands of justice. One thing is certain; the question, "when are the schools integrated?" has taken a great deal of judicial time. The question, "when are the schools equal?" is, if anything, even more difficult to handle and promises to demand an even greater allocation of scarce judicial man-hours.

In all of these fiscal matters both defendants and plaintiffs will produce their "expert witnesses," not to mention a number of amicus curiae briefs filed either on behalf of, or in collaboration with, additional "authorities." The public finance of education is certainly no more of a science than educational psychology, sociology, or indeed any of the other social and behavioral sciences currently being professed. Therefore the courts will find that respected economists and educators will not concur completely on whether a set of fiscal

arrangements does, or does not, contribute to equal educational opportunity. Fortunately the courts have developed ways of handling conflicting expert testimony. Anglo-Saxon jurisprudence still assumes that the "rule of right reason" will rise above trial by combat of learned advocates and more recently warring social science knights. Let us hope this bedrock assumption is sound. If it is not we are all in trouble.

APPENDIX A

DERIVATION OF COMPUTATIONAL FORMULA FOR THE GINI INDEX

If we are to plot y_i's vs. x_i's on a diagram as shown in figure 1-1, the curve would slack away from the diagonal if inequality exists. The degree of slackness of the curve is a measurement of the degree of inequality. The slackness may be represented by area A in figure 1-2. The derivation of the formula for the Gini Index is as follows:

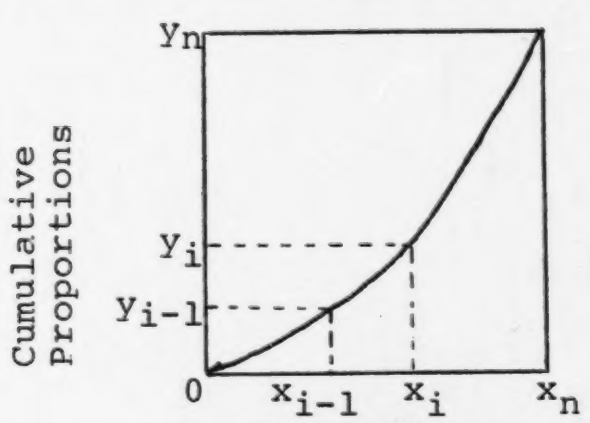

Fig. 1.1

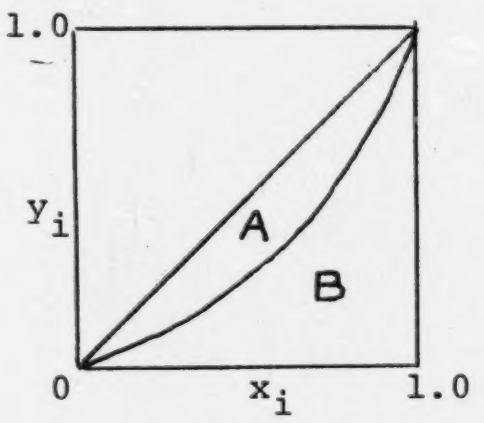

Fig. 1.2

Gini Index $$G = \frac{\text{Area A}}{\text{Area (A+B)}}$$

$$= \frac{0.5 - \text{Area B}}{0.5} \qquad (1)$$

$$= 1 - 2 \text{ Area B}$$

From Fig. 1-1

$$\text{Area B} = \sum_{i=1}^{n} \frac{(x_i - x_{i-1})(y_{i-1} + y_i)}{2} \qquad (2)$$

Substituting Eq.(2) into Eq.(1), we get

$$G = 1 - \sum_{i=1}^{n} (x_i - x_{i-1})(y_{i-1} + y_i)$$

If we are to expand the terms above, we will have

$$G = 1 - \sum_{i=1}^{n} (x_i y_{i-1} - x_{i-1} y_{i-1} + x_i y_i - x_{i-1} y_i)$$

$$= 1 - (x_1 y_0 - x_0 y_0 + x_1 y_1 - x_0 y_1 + x_2 y_1 - x_1 y_I + x_2 y_2 - x_1 y_2 + \cdots + \cdots + x_n y_{n-1} - x_{n-1} y_{n-1} + x_n y_n - x_{n-1} y_n) \quad (3)$$

The results of the expansion are that

1. All $x_i y_i$ terms for i=1,2,...,n-1 are cancelled.
2. The term $x_0 y_0$ is equal to zero.
3. The term $x_1 y_1$ is equal to one.

Therefore, Eq. (3) becomes

$$G = (x_0 y_1 - x_1 y_0) + (x_1 y_2 - x_2 y_1) + \cdots + (x_{n-1} y_n - x_n y_{n-1})$$

$$= \sum_{i=1}^{n} (x_{i-1} y_i - x_i y_{i-1}) \quad (4)$$

APPENDIX B

THREE FORMULAE FOR GENERAL PURPOSE EDUCATIONAL GRANTS-IN-AID USED IN THE UNITED STATES

The following three formulae are used in various states for the purpose of distributing state funds inversely to the property valuation of local school districts. Each state has made extensive modifications of the "pure" forms presented here.

I. The Foundation or Strayer-Haig Formula:

$$G = FP - rV$$

where:

F = Expenditure per pupil established by the legislature as the level at which education will be supported in the state

P = Number of pupils in local school district

r = Required local tax rate, sometimed called the "qualifying rate."

V = Property valuation in the local district

II. The Percentage Equalization Formula:

$$G = EP\left(1 - .5\,\frac{V_i}{V_s}\right)$$

where:

E = Local expenditure per pupil

P = Number of pupils in local school district

V_i = Property valuation in the local district per pupil

V_s = Property valuation in the state per pupil

III. The Resource Equalization Formula:

$$G = P\,[r\,(V_g - V_i)]$$

where:

r = Educational tax rate in the local school district

V_g = Property valuation guaranteed by the State per pupil

V_i = Property valuation in the local district per pupil

P = Number of pupils in local school district

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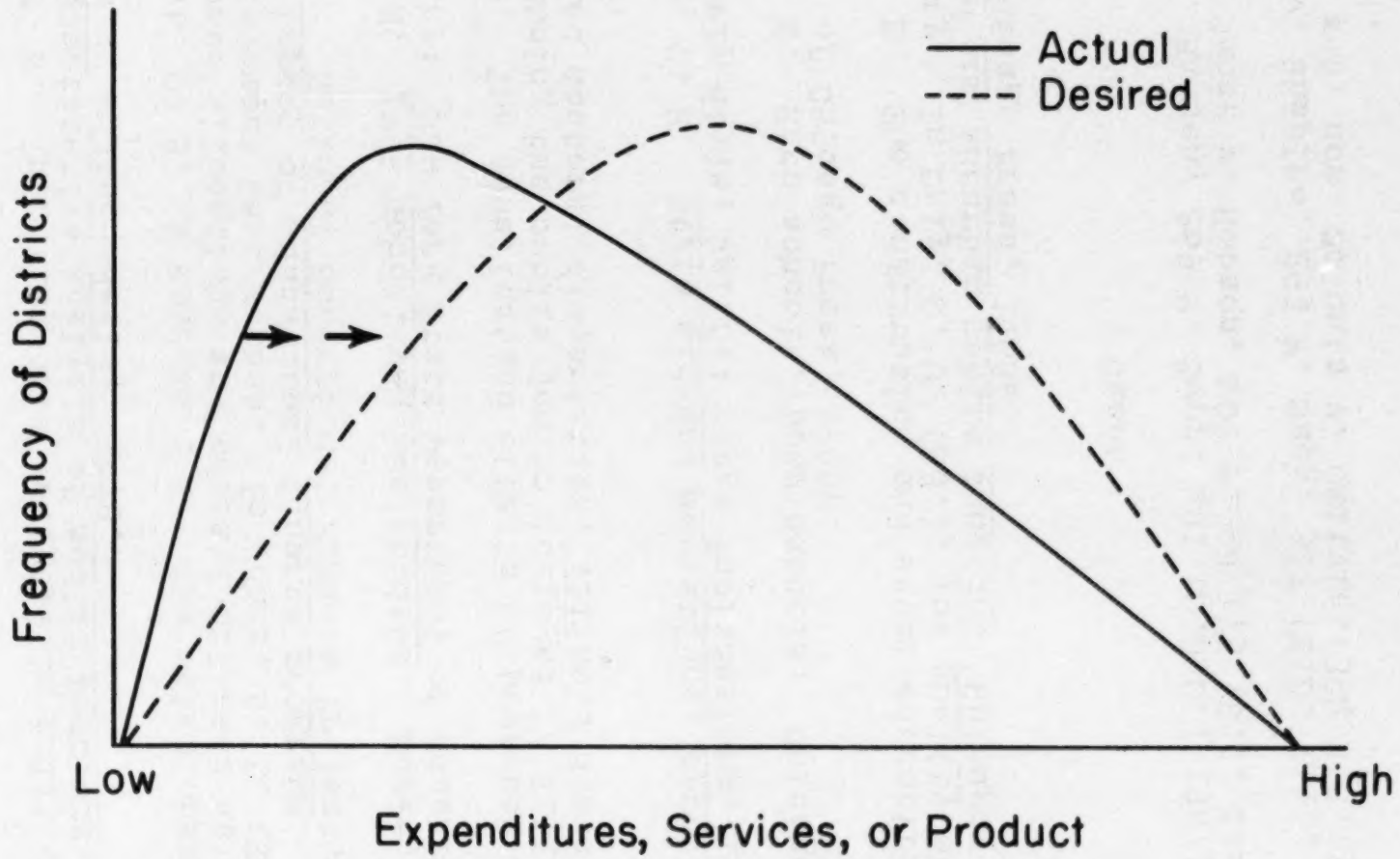


Figure I: Permissable Variance Model

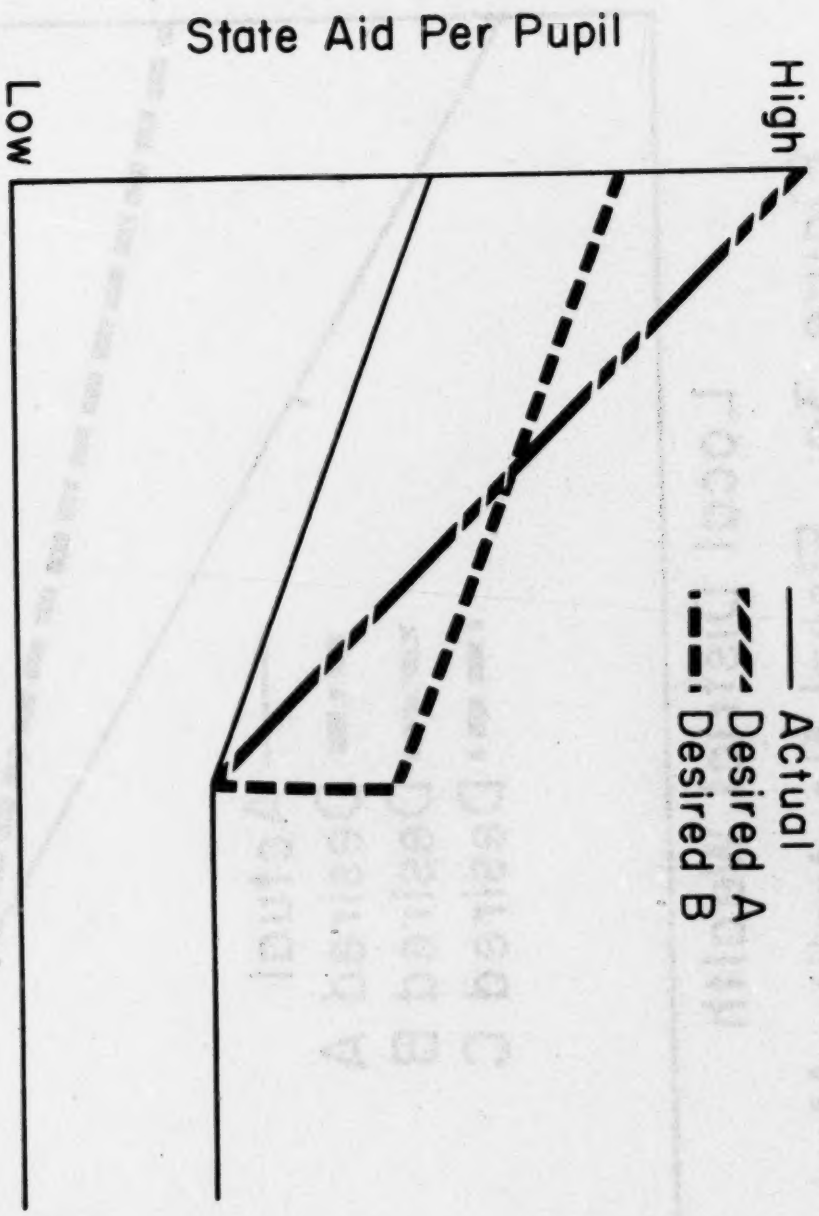


Figure 2: Inverse Allocation Model

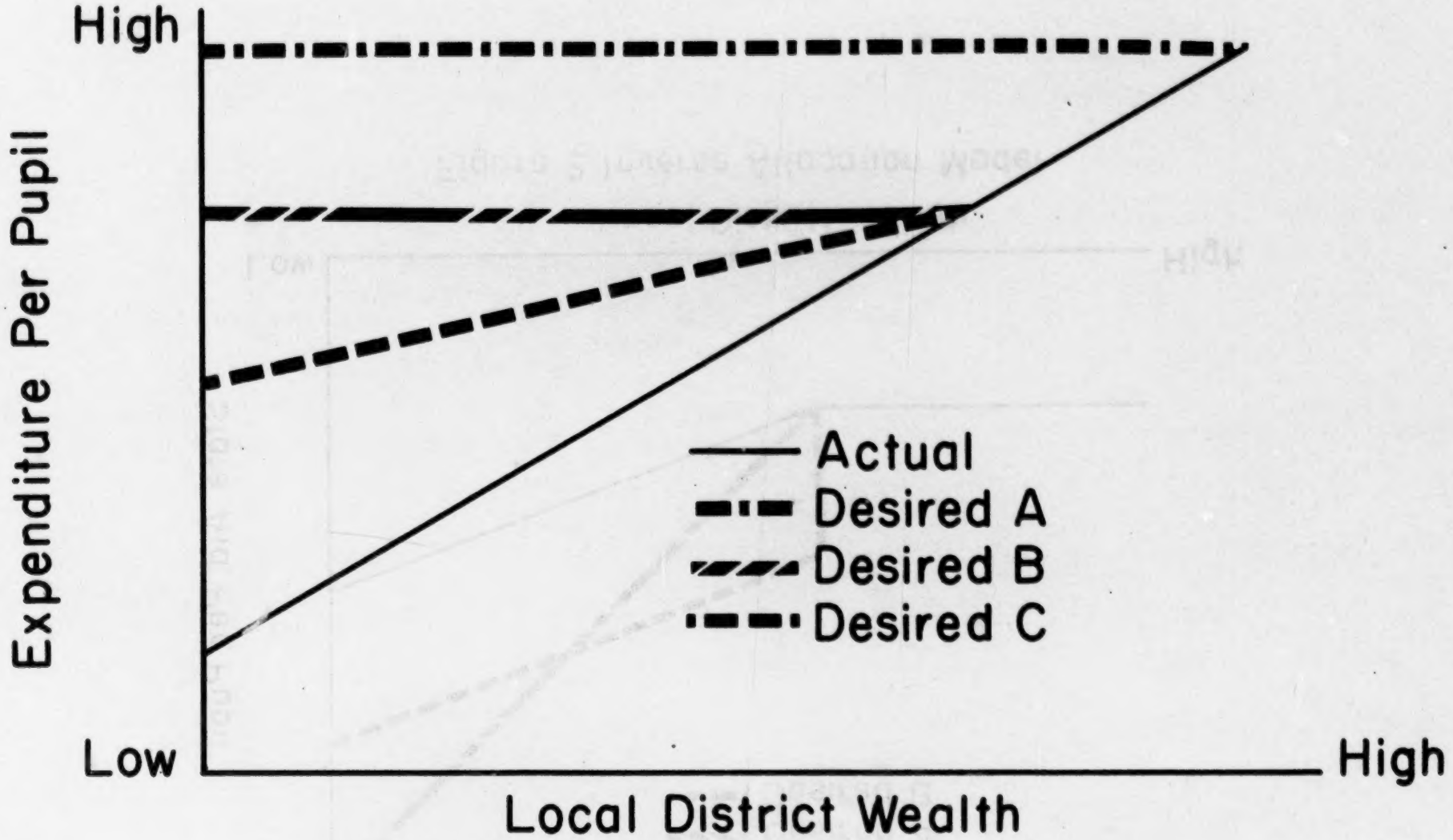


Figure 3a: Fiscal Neutrality Model

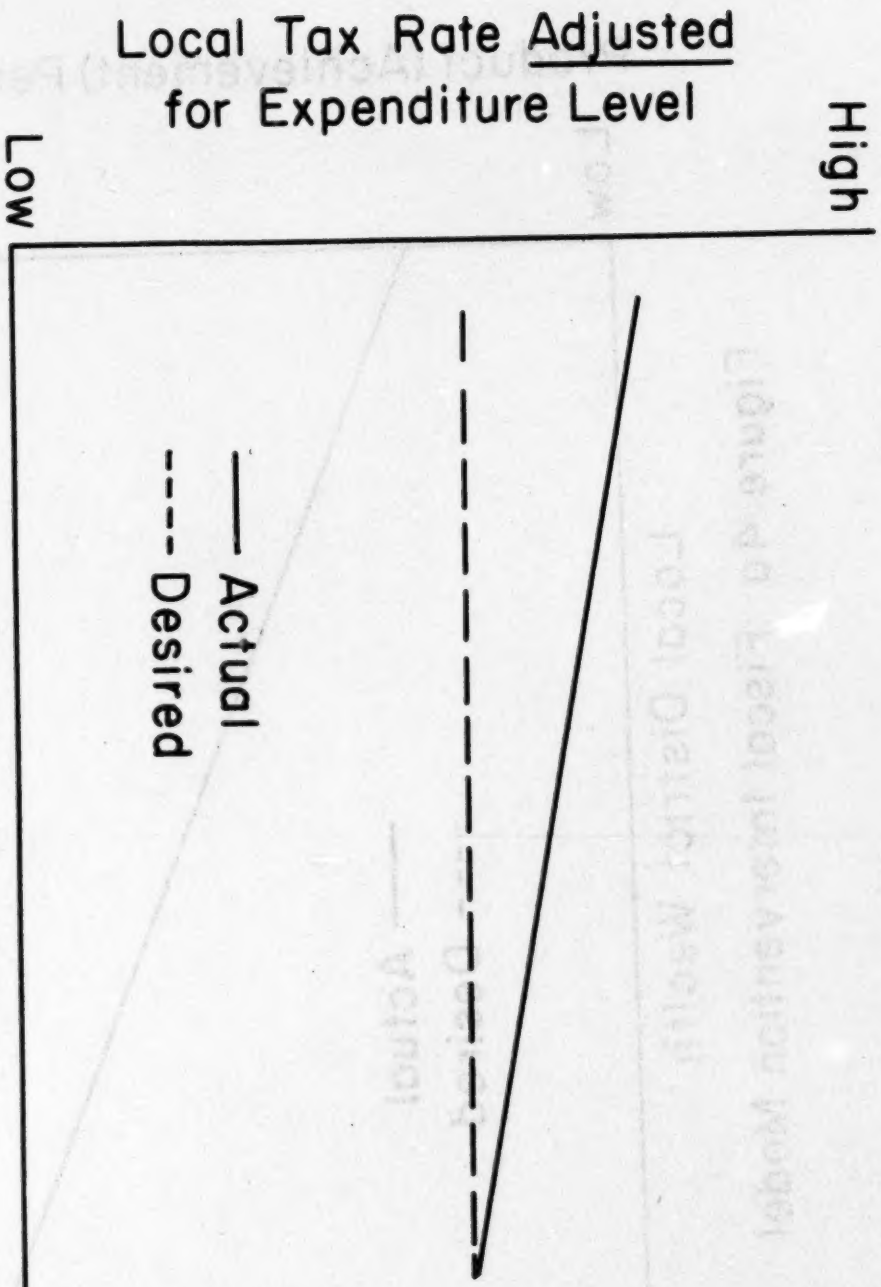


Figure 3b: Fiscal Neutrality Model

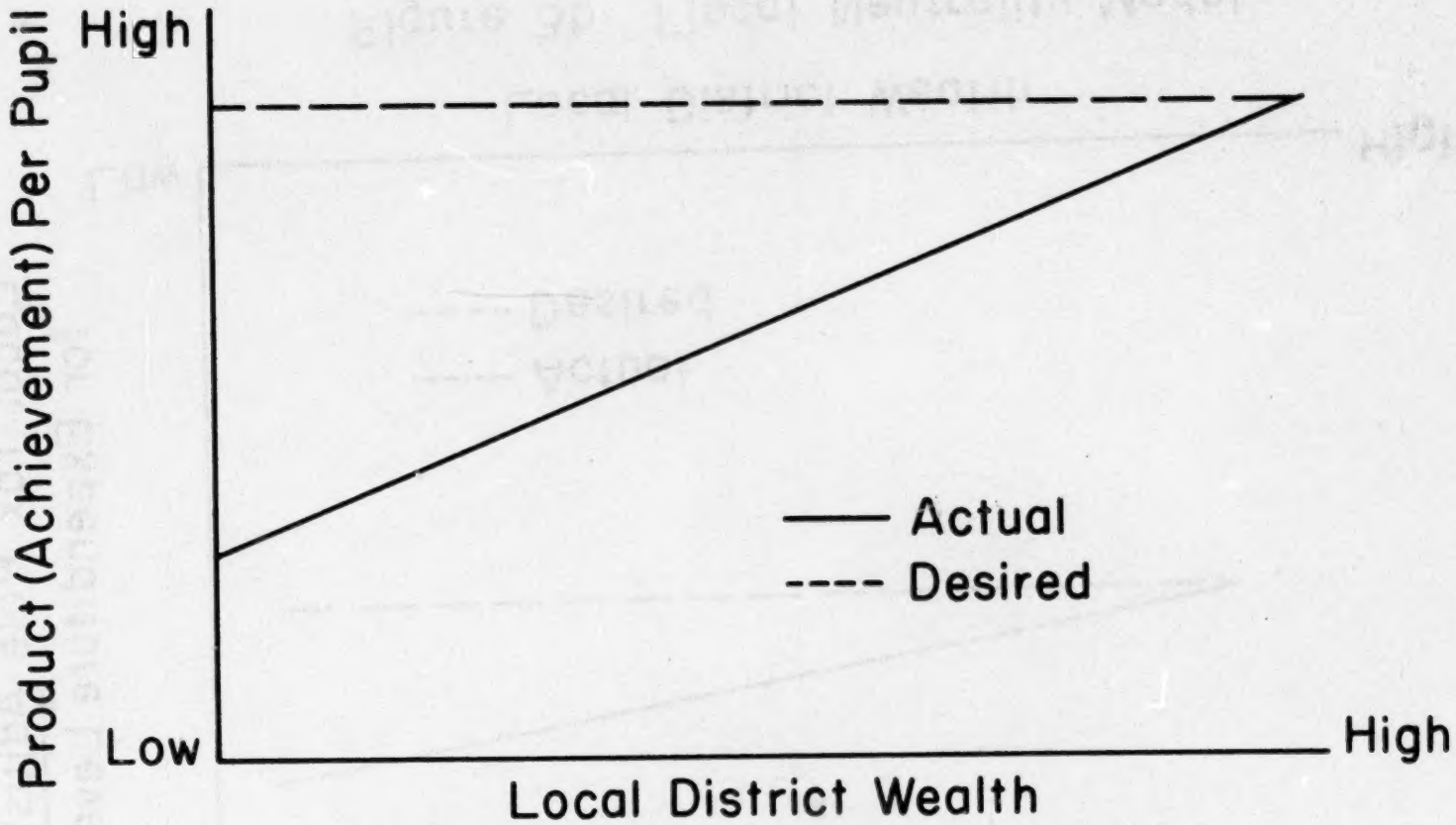


Figure 4a: Fiscal Intervention Model

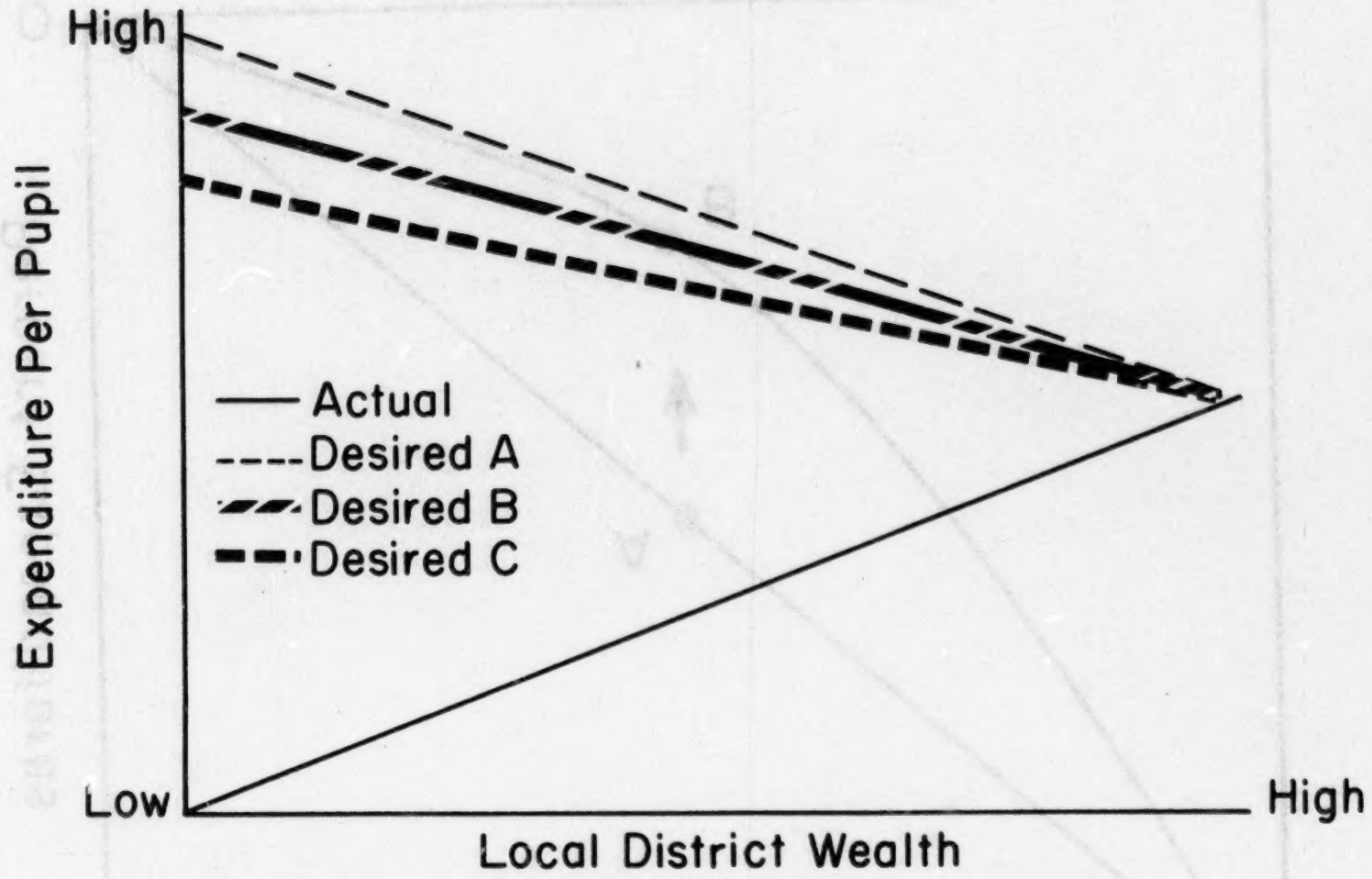


Figure 4b: Fiscal Intervention Model

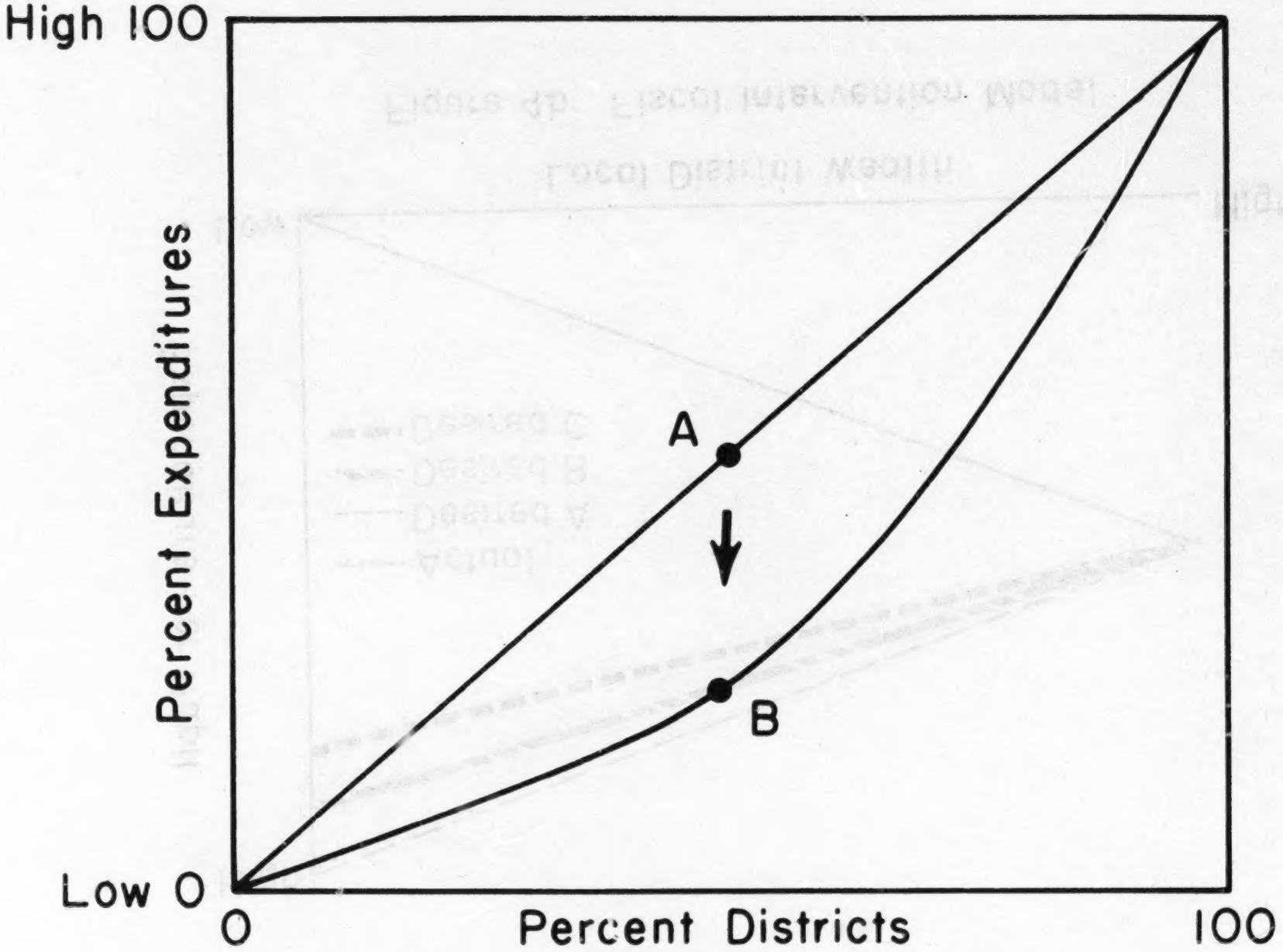


Figure 5: Lorenz Curve: Univariate mode

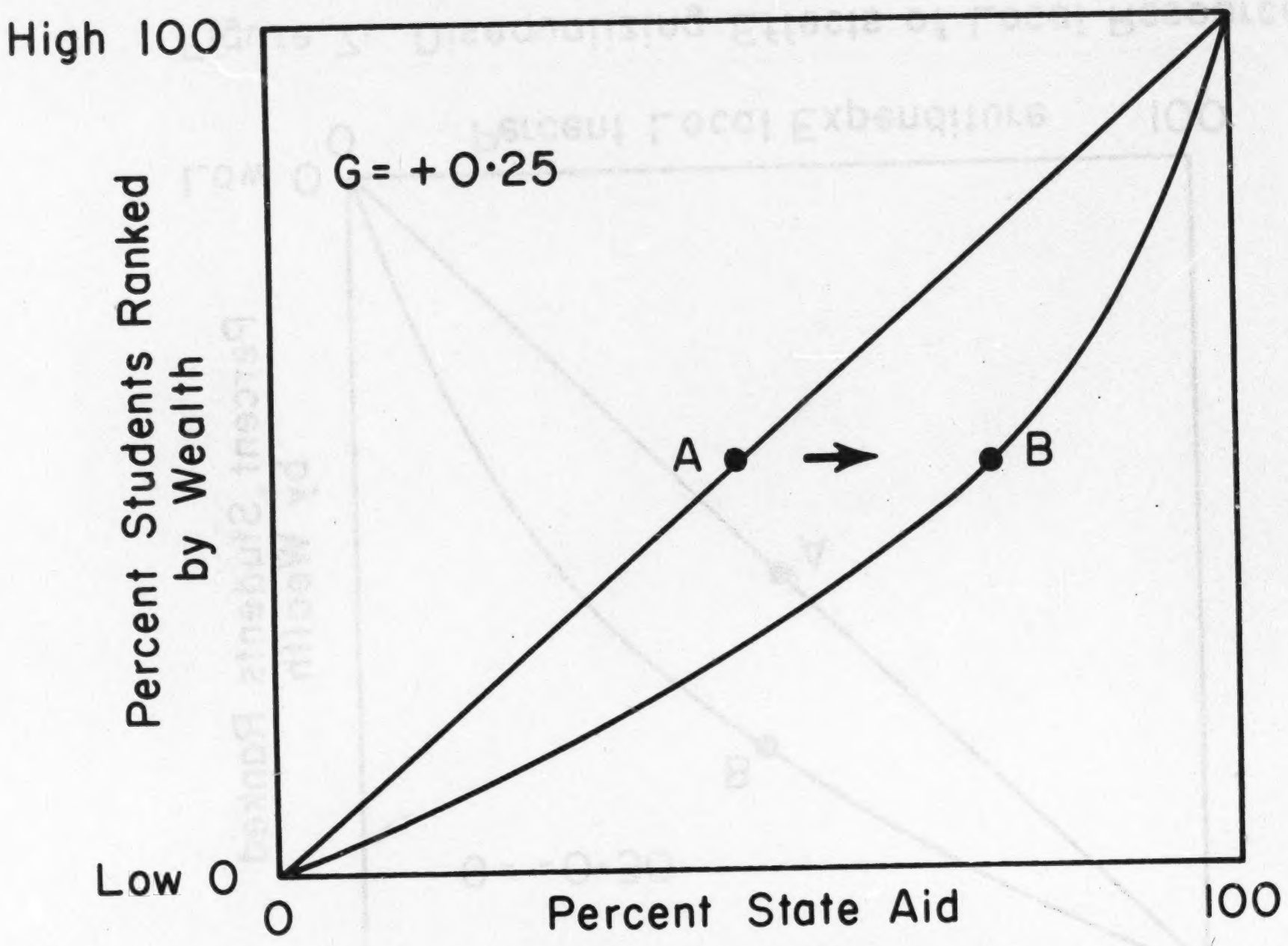


Figure 6: Effect of State Aid shown by Lorenz curve in Bivariate Mode.

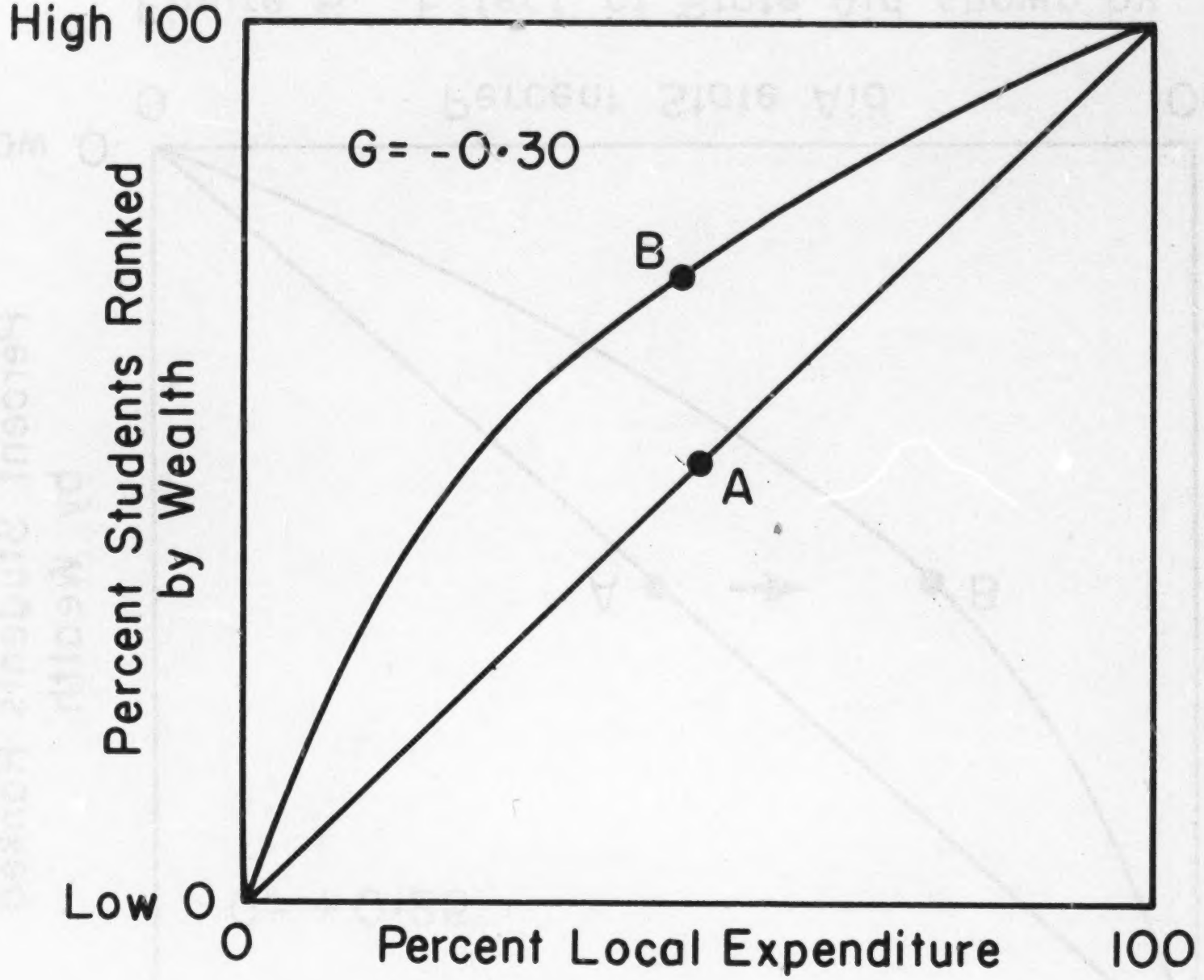


Figure 7: Disequalizing Effects of Local Resources shown by Lorenz curve.

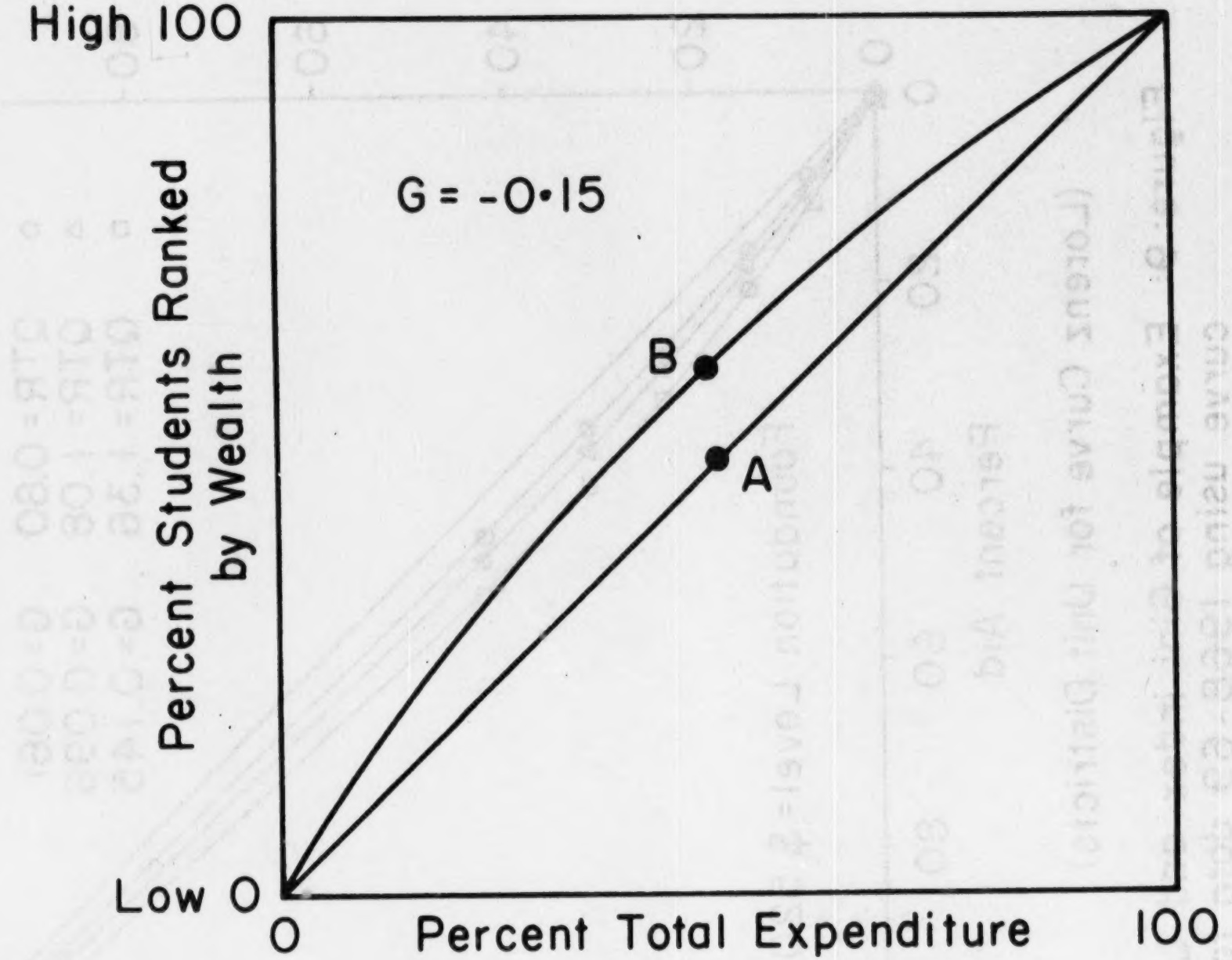
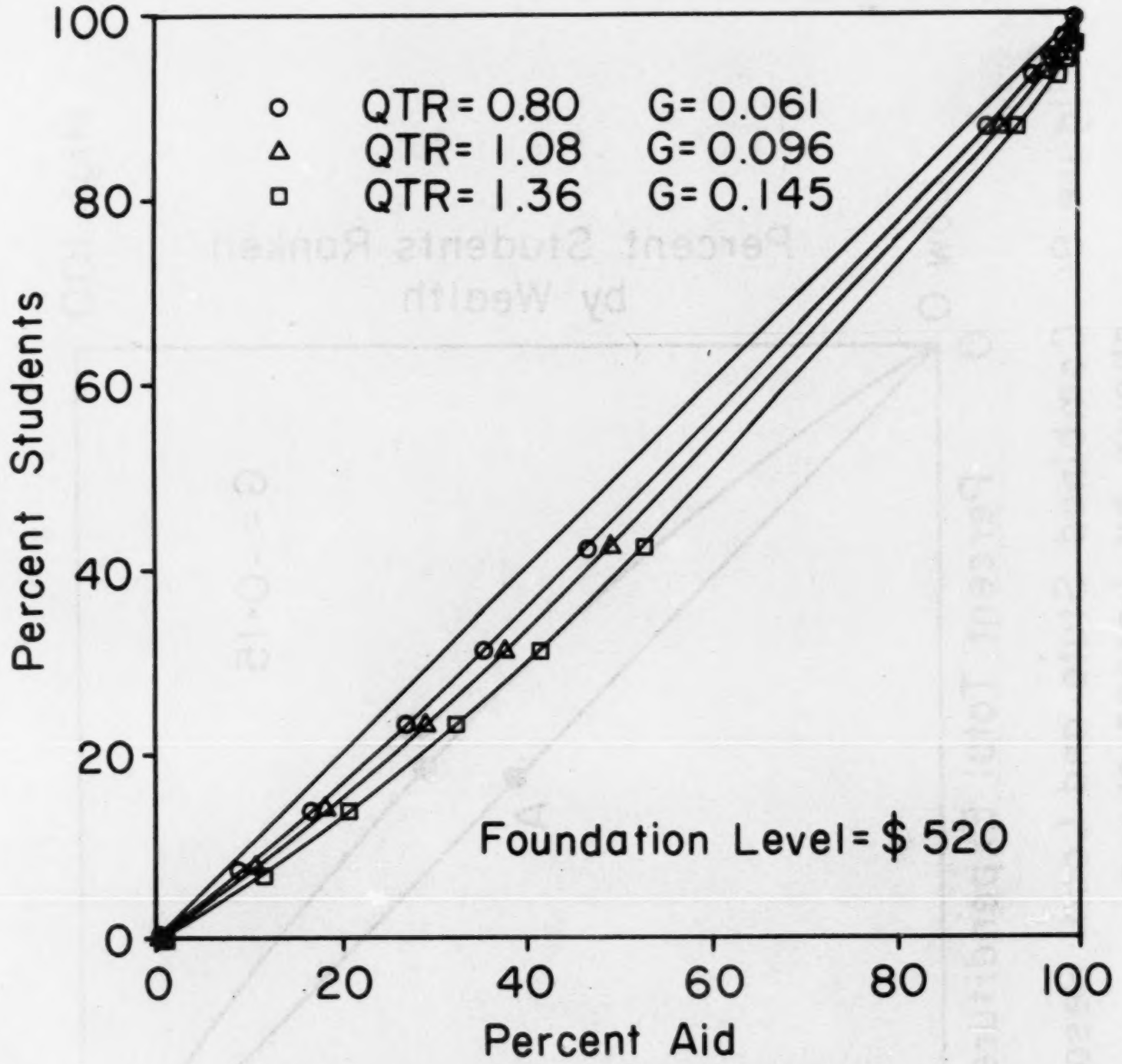


Figure 8: Combined State and Local Resource Effects shown by Lorenz curve.



(Lorenz Curve for Unit Districts)

Figure: 9: Example of Gini index and Lorenz curve using 1968-69 data for K-12 districts in Illinois.

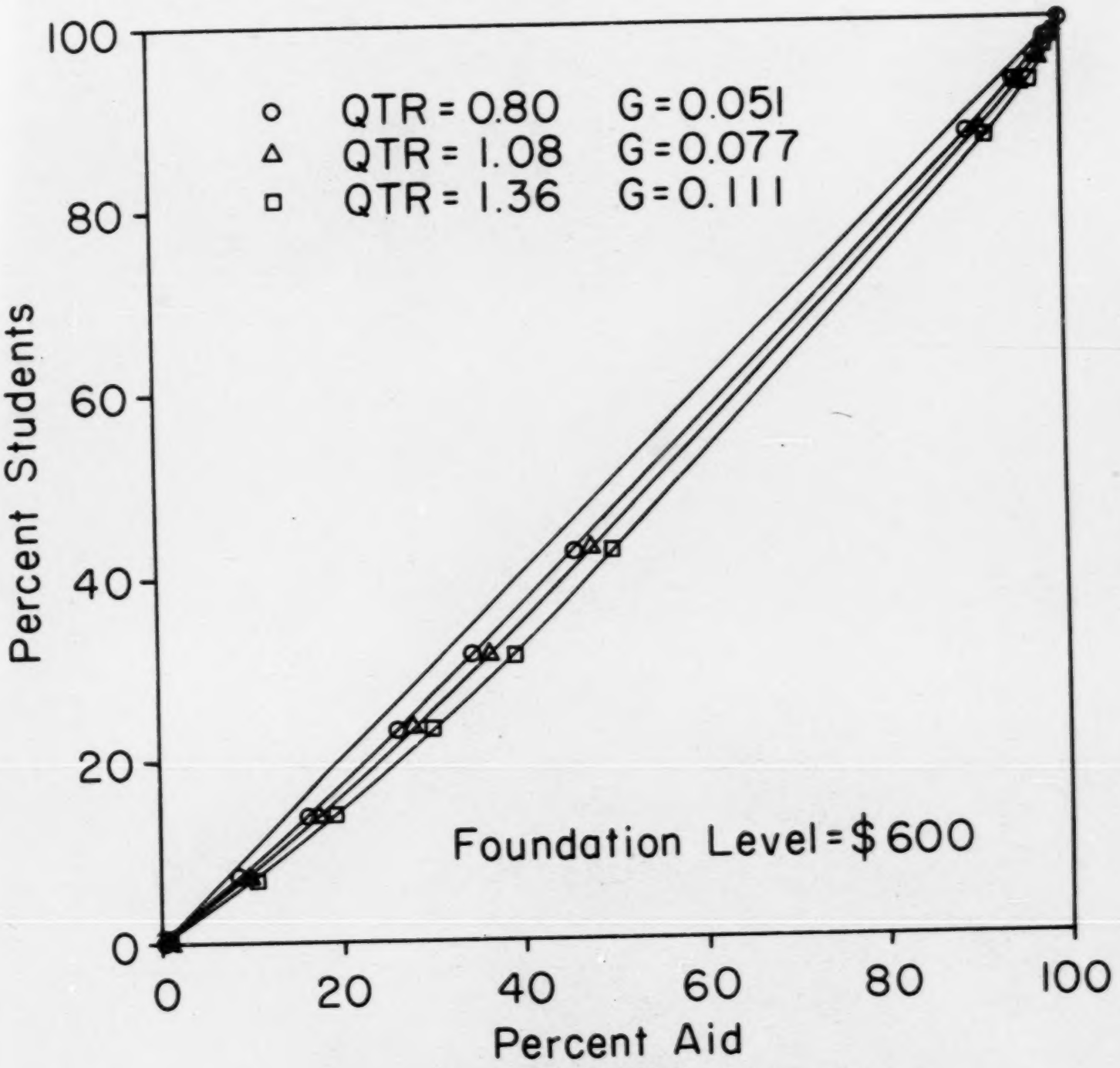


Figure 10: Example of Gini index and Lorenz curve using 1968-69 data for K-12 districts in Illinois.